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BULLETIN

OF

THE JOHNS HOPKINS HOSPITAL.

Vol. IX.—No. 93.] BALTIMORE, DECEMBER, 1898. [Price, 15 Cents.

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MEDICINE IN THE NINETEENTH CENTURY.

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(*Delivered before the Johns Hopkins University, Oct.* 17, 1898.)

Were we asked to describe in a phrase the tendency which distinguishes our age it might be replied that it is the study of origins. In the later thirteenth and early fourteenth centuries, for example, men's minds were fixed for the most part on the validity of dialectic, were bent rather upon securing mental surefootedness and sharp and true weapons of thought than upon the verification of premises. For instance, Albertus Magnus, with the utmost fairness, marshalled from the writings of his adversaries thirty arguments in favor of the doctrine of the oneness of the soul; so that on the death of the individual his share is merged again in the whole, and loses whatsoever personality it may seem for a time to have assumed; on the other hand for the doctrine of the persistence of individual souls after death he found thirty-six valid reasons; thus the essential multiplicity of the soul was proved. Again Raymond Martini found eighteen reasons for the eternity of the world, and eighteen against it; the doctrine hung anxiously in the balance until he discovered seven other reasons which fortified it; he scrupulously admitted indeed that the last seven were not altogether apodeictic, but "with the reinforcement of faith" they sufficed to sustain it. Thus again for these disputants Aristotle and Galen were not so much chosen as received as guides, and their scriptures accepted as bibles. Now although it is not fair to press this character as a conspicuous feature of the greatest minds of the latter half of the thirteenth century, for Thomas of Aquino, for example, regarded Aristotle as a pagan sage to be treated with no more than respect, and it is still less true of Roger Bacon, the greatest of them all; still it was the fashion of that time to look rather to agility and sureness of logical fence than to genesis and verification. To one of our own time who turns to their pages, or of John Henry Newman in our own time, the quickness and subtility of their arguments, the keenness and variety of the language which they elaborated by incessant exercise in such dialectic, make a most interesting study. Therein indeed the reader may find cause to regret that in modern times we have too often allowed these instruments of close and strong logic to fall into rust and neglect, though in our own time again we shall not thus speak of our greatest minds; to confine ourselves to our own race, argument more sure and penetrating than that of Newton, of Faraday, or of Darwin, for example, is not to be found in any century. Still the common mind of our time is set rather towards the investigation of premises—of origins; we look less to the closeness of our web of arguments, and take less heed to every logical stitch than our forerunners, who took their causes for granted and thought only how to fight for them. Yet although we may escape too cheaply in respect of logical processes on one way, we must travel at least as warily, namely, on the

method of experiment. Generally speaking, facts are now preferred to arguments, and as facts so far from being the fixed and flinty things they are supposed to be, are shifty and protean, we require from those prospectors who proclaim the discovery of facts a minute demonstration of their methods, and we do not allow any agility in verbal fence to put us off this prime demand. Show us your clews, take us over the tracks you say you have surveyed, bring us into the ambush of nature which you think you have discovered; for howsoever finely you may talk about them we shall not believe you until we in our turn have followed you on the path. This at any rate is the attitude of those who pursue the exact sciences, and it is with the sciences, whether of experiment or observation, that not we only but also our fathers of the thirteenth and fourteenth centuries were concerned.

It may be urged that surely these sciences are the labor of our times, not of earlier times when sages spent their time in sophistry! Yet such an assertion is scarcely justified. Such is the essential kinship of man in all ages that by whatsoever names he calls them, or by whatsoever methods he pursues them, his search is after the ends of science; I mean his argumentative search, for I am not at present speaking of artistic creation. When we turn to the speculations whether of the Greeks, or, after them, of Western nations, we find that they concerned themselves with the same subjects as those of the modern thinker; they argued of cosmogonies, of the elements of nature, of ethics, of law, of the virtues latent in natural objects, and so forth. The antagonism between the conceptions of creation and of development is not, as too often we think, a division of our own time only; in cruder forms, but still in full distinction, these opposing theories were familiar to philosophers of the fourth century before Christ as well as of the thirteenth century after Christ. The explanations given in such days as those differed widely from ours, but they were explanations, and were discredited only because they turned out to explain too little. Even to-day the experimental method can only be applied to the exact sciences; to the moral sciences and to medicine, for example, dialectic must still be largely applicable. In the study of medicine the experimental method has but a narrow field; observation takes a higher place in its pursuit, but dialectic has also no inconsiderable part, and we shall do wrong if we allow instruments fashioned under other conceptions of method to fall from our hands under the attraction of the richer results of the modern methods of the exact sciences. While ethics and politics must largely depend on dialectic and mechanics, let us say but little on it—though mathematics is indeed in itself a sublimated dialectic; medicine, occupying a middle position, must keep both weapons furbished. For instance, a true conception of causation is largely a matter of dialectic, and however ingenious our experiment and observation we cannot afford to be ignorant of the laws of causation and of thought, and of the language in which these abstract ideas are to be expressed. For this language, I repeat, we are indebted to our forefathers of the thirteenth and fourteenth centuries as well as to Hume and to Mill. I have hinted that we are too prone to think, indeed to vociferate, that a fact is a fact, forgetting that inference is of the essence of every proposition; inference sticks to fact as closely as shadow to substance. A statement of the plainest facts implies a cement of inference, and he who has learnt to handle ideas will thus far have a great advantage in every research. Looseness in words and lack of lucid and orderly expression of ideas in the records of modern medicine is lamented by Dr. Da Costa in his address to the Association of American Physicians and Surgeons, May 4, 1897, and in a recent leading article the London *Times* laments the same defects in English lawyers of the day and urges the need of a more formal education in this great accomplishment. Those who decry dialectic decry also what they are pleased to call "theory." That such and such a teacher is too "theoretical" is a stone thrown in many a classroom, and often no doubt it hits the mark. It is true that to pursue philosophy as a study in itself has been a source of mischief or of bewilderment in many schools, as in Germany and in Scotland. Nevertheless we are now beginning to find that long practice in theoretical, that is in abstract, thought has given both Germans and Scotchmen a strength in dealing with modern and more fertile problems which Englishmen at any rate somewhat jealously and somewhat impotently admire. In England we are apt to retort that we are saved by our adhesion to the inductive method. If such an one—and now I may pass beyond my own land—be asked what he means by induction it turns out that he means, or thinks he means, a mosaic of concrete observations. Not only does he fail to realize that even these are bound together, as I have said, by a cement of inference, but perceiving, as he unconsciously must, that such short links do not carry him far in explaining things, he takes refuge in assertions which indeed are broad enough but have taken on appearance of solidity from their established currency. Mrs. Grundy is not unknown even in the sphere of abstract propositions; use and convention may make the hollowest surmises respectable and their acceptance comfortable. It is by no means true that the ordinary man hates abstract propositions; he loves many of them, as for instance that the weather depends on the phases of the moon; that most bodily discomforts arise from disorders of the liver, and so forth. There is no proposition, however wide and abstract, which he will not swallow with avidity if it be brought from the pages of an old almanac; nay, easy as knowledge outgrows such outworn opinions he will yet strive to extract some truth from their arid sources—to prove that there is "something in them after all." What the ordinary man hates is not the abstract proposition but the making of abstract propositions. He inherits any ready-made theory gladly, but he resents being called upon to make one himself, or even to adapt his mind to such novelties; he has never been practised in this gymnastic and it jades him. He dislikes it as we dislike any unaccustomed exercise, as we love an old coat or an old pair of shoes.

I need not occupy your time, gentlemen, by pointing out that the inductive method consists of two processes at least—in observation and imagination; in imagining again and again from a short series of facts the probable course of a longer series; and then in testing the truth of all or any such notions until the right one is hit off. Such surmising requires an alert imaginative or theorizing faculty. To pursue the study of philosophy for itself alone has only a gymnastic value, and leads, as I have said, to routine and sterility; but I repeat

also that past exercise in this faculty, barren as it seemed for awhile, turns out, when carried into more fertile fields of research, to have given to such students a suppleness and sureness of argument which we may well envy. The Anglo-Saxon brain contains, as its literature has shown, the sanest and strongest imagination of any in the world; but thus far in the world's history it has been rather a pioneering brain, a fighting brain, whether with man or Nature; and immediate material results have been prized to the disadvantage of the more prophetic powers. The Anglo-Saxon has fought rather for bread to-day than for cake to-morrow; nevertheless, the future will be for those who can combine the practical spirit with a mind exercised in the arms of theoretical and dialectical precision.

What we have learned, then, is that speculation in former times has been valuable as exercise rather than as achievement; that, although the deductive side of our method of thought is better adapted to exposition, the inductive bias is for most men the safer way in research. In the words of Klebs (Allgem. Pathologie, vol. i, p. 4), we must learn not that the construction of hypotheses is bad, but that "Diese Hypothesenbildung nicht das Spielzeug einer weitschweifenden Phantasie sein soll, sondern das Werkzeug ernster wissenschaftlicher Arbeit."

Among the lessons of this kind which we have painfully learned during the last two thousand years two stand out perhaps as the chief; these are, first, the barrenness of all conceptions based upon causal entities; secondly, the constraining need of verification. First, concerning causal entities, there has been a tendency of late to bring back into physiology the notion of "vitalism" or "vital force," and to scoff at those who would apply the word "mechanical" to the processes of life. It may well be that the connotations of the word mechanical embarrass us in the use of it to signify the complex phenomena of life; on the other hand, we are on safe ground so long as we endeavor from the simpler phenomena of physics to rise continuously to conceptions of the more complex phenomena of life; at any rate, we must not desert this track so far as it goes, and within these limits there is plenty to discover. But, under whatsoever name, to import an occult principle as a cause is to return to the most sterile rhetoric of the middle ages. Unable to shake themselves wholly free from the personification of natural objects, a personification which had gradually been removed from the objects themselves to their supposed causes, the ancients assumed such a principle to govern the movements of the celestial bodies; and even to this day we are apt to speak of force as something or entity acting on matter. That physical forces acting as simple molecules can account for the complex phenomena of life no one wishes to assert; no one will assert that they can account for the phenomena of chemistry in which the molecules, though less complex than the living, are far more complex than those studied in physics. But if we are to assume a vital principle in the animal cell assimilating food, then what need is there of a study of any other forces? The fact is, we are too impatient to await the unravelling of the manifold composition of forces in a highly compound molecule, an investigation which is only possible by long and unwearied series of experiment. No one attributes the virtues of chemical molecules to "chemism"; nor the vastly more complex functions of societies to a principle of socialism. Products differ from factors as sugar differs from a mixture of carbon, hydrogen and oxygen, and as an organism differs from the unrelated activities of an aggregate of nucleated cells. The phenomena of life are wholly conditioned by the peculiar complexity of its molecule, and with the size and complexity of the molecule the synthesis of forces increases in a multiple ratio.

We may speak, then, of a molecule as a highly elaborate construction of matter, or we may regard it as a highly elaborate system of forces, and this view of life, which brings its phenomena into line with the subject-matter of other sciences, is one, at least, of the achievements of our own time which we shall do well to preserve.

Another conception which now rules our thoughts far more profoundly than ever before in the history of mankind is that of law in the course of Nature. Far indeed from a new idea—for that Nature works by fixed laws, first conceived by the sages of Ionia, had penetrated the minds of thinkers of the fifth century before Christ, and moulded the thoughts of Hippocrates. This great conception, by means of which alone a knowledge of Nature and an empire over her become possible, was afterwards obscured for many centuries; it was left, indeed, for our own day to grasp the idea in its full meaning. The Ionians were not free from a tendency to personify these laws, and even to-day we may hear the Laws of Nature spoken of as agencies by which Nature is compelled, rather than as our formulas for invariable sequences. Yet it is no exaggeration to say that, even in its ontological form, a true conception of natural law was a greater achievement of the mind and more important in the advance of knowledge than the doctrine of the conservation of energy or the conception of evolution—ideas which we are wont to regard, and rightly to regard, as consummate achievements of modern philosophic theory. Again, the perception that activity of thought can only be true and just in the best sense when it is in vital and incessant connection with the activities of the phenomena on which it is engaged, is an invaluable quality of modern thought.

An accomplished Oxford tutor, lately taken from us, said of another department of knowledge: "One always comes back to the feeling that the truth in the ultimate problems is not got by thinking (in the ordinary sense), but by living." What Nettleship experienced in the study of ultimate problems is no less true of proximate problems.

It was for lack of this touch of nature that the older universities of Europe fell out of line with life. Whether for the analysis or for the harmony of knowledge, we cannot keep before us the quality, depth, complexity and manifold interaction of natural processes without incessant converse with them in their flow. We cannot retain a conception, nay, not even an apprehension, of the infinite vastness and variety of the work of the eternal loom by taking thought alone, by discussing them as if we were gods. Our minds can only be edified with Nature's bricks; beside her work the worlds we build out of our own heads are but doll's houses. Philosophy,

as a mere literature, ends, as I have said, in conjectural systematizing, in speculation upon speculation, in a visionary gymnastic. Oxford scorned the "base and mechanical pursuits" of Boyle, and the wiseacres who so spoke of that great man are dead and forgotten. Medicine in Germany was almost grotesque until the day of Rokitansky and Müller. Moreover, ideas thus engendered are not only hollow and arid, but they have all the rigidity and inertia of inanimate things; they become as shells which happily may be sloughed off but never have part in new development, and meanwhile are strangling the very germs of it. Ardent enquirers in touch with nature are thwarted or extinguished, and Nature, indifferent as ever to man's self-sufficient conceits, goes her own way like a wild dam eating up her own offspring. Not only are notions engendered without the seed of Nature contrary to the truth; they are also antagonistic to the discovery of the truth. As Dr. Daremberg says, "Les idées sont plus entêtées que les faits." Is it not one of the marks of our own age that man is not only now freed from the bondage of authority, not only is he now free of the kingdom of pure thought, but he is also brought into touch with Nature; now Nature is to be his inspiration, not his destruction.

Even in my young days the first chapter of Genesis was generally held in its literal meaning as a string of affirmative propositions; and for many previous generations the advance of true conceptions of biology had been continually thwarted thereby. In medicine as well as in natural history we are dependent on true biological conceptions, for without them we are apt to lie content with empiricism.

Again, with evolution has arisen a living conception of progress; mankind, no longer dreaming about a golden age in the past, is set with its face to the future; the golden age is in the future, not in the past, and the happiness of the human race is to be won by reading the secrets of natural law, and by strenuous effort. Yet this dream of a lapsed golden age, like all such myths, held some truth in it; a truth which, in the revolution of the standpoint from past to present and future, fell into neglect. The study of the past is now returning in a new spirit, in that *study of origins* which, as I have said, is a feature of our generation; and the neglected lesson that we cannot afford to forget the travail of any age is seen in a new light. Tradition is recognized as the mould into which our activities have run as an embodiment of human experience; and we are learning the humble lesson that modern man is perhaps no greater in faculty than his forefathers; that if we have entered into new and more fertile fields it is by means of our inheritance rather than by means of greater faculties. If the average modern man be as highly endowed as the greater ancients some few of them, such as Archimedes or Aristotle for example, were perhaps richer in mental gifts than the greatest of modern men. If this be so it will appear that *tradition* is a larger part of progress than we are disposed to admit. If the transmission of acquired faculties by inheritance be not altogether disproved, it is proved at any rate that such inheritance is a much smaller factor in progress than we had assumed. It seems certain indeed that its sphere is at best a very small one; and that we stand at the apex of the pyramid not by virtue of better building but because we were born with the pyramid below us. To contemn or to subvert the ideas of our fathers is then to cut the ground from below our own feet; to destroy that accumulation of the results of former labors which in commerce we call capital, and which in things of the mind we call tradition. There is no evidence that we are greater even by virtue of a more highly organized brain; there is no evidence that we are a new and more gifted variety of man; we are greater because we are born richer in circumstance, richer in the gifts and endowments whether handed down to us in material shapes or as learning from past ages. If in certain ages of the world tradition has held too large a place in the admiration of men, and has laid too heavy a hand on freedom and originality of thought, we may yet appreciate the due value of tradition in our own advance, and our duty to our descendants in preserving for them all that seems good in our own time, while our minds play freely nevertheless, and are not smothered by its weight. For as Plato says in the Ion: "There is a stone which Euripides calls a magnet, but which is commonly known as the stone of Heraclea. This stone not only attracts iron rings, but also imparts to them a similar power of attracting other rings; and sometimes you may see a number of pieces of iron and rings suspended from one another so as to form a long chain, and all of them derive their power of suspension from the original stone. In like manner the Muse first of all inspires men herself; and from these inspired persons a chain of other persons is suspended, who take the inspiration." May we not accept this beautiful figure which Plato imagines of poetry to signify all tradition by which man is enriched and advanced. "Through all these," he says, "the God sways the souls of men in any direction which he pleases, and makes one man hang down from another." It is in our great seats of learning, such as this in which I am now speaking, that men forge and hand down to their children the cosmos of inherited experience in which we dwell and about which we breathe an atmosphere which forms and inspires without our being conscious of its presence. If we may counsel that our minds shall come to Nature "disencumbered, clear and plastic," this counsel has regard to the accidents of mental occupation, not to the edification which began in the cradle and ends only as the faculties of assimilation in each of us are outworn. You will thus be prepared to know that our great ancestors among the ancients, however vast their mental endowments, could not have built up true doctrines. The empirical method is the necessary porch of entrance into science; and there can be no true generalizations till facts have accumulated in quantity sufficient for the foundation of them.

To Hippocrates little was possible beyond superficial clinical observation; anatomy and pathology were slowly to be built up by harassed and painful men in many a broken century to come. But Hippocrates, thus confined to clinical observation, could describe such general movements as fever calculate, and the phases of disease in time—as acute and chronic, as subject to crises, and so on; and again, on this chemical basis he formed the great conception of diathetic diseases, so that thenceforth many diseases were no longer regarded as isolated events, but as terms in series. While we admire the breadth of these conceptions we admire also the genius which all attain to them when

no other kind of enquiry was then open; for it was not until the time of the school of Alexandria that anatomy and pathology could be said even to begin. Nosological detail, as we daily study it, was out of his reach. The method of experiment was not even formulated, though Littré has reminded us that Hippocrates made the profound observation that no study of the brain could have led us to foresee that wine would produce so peculiar a disturbance of its functions. It was left to Galen to bring empiricism, clinical observation, normal and morbid anatomy, and even experimental methods together in one coordinate study, soon however to be eclipsed in the darkness of the middle ages. Even to this day physicians have not assimilated the lesson that disease is not an entity but a particular state of the body and has no more of a separate or objective existence than, let us say, the constellations of the Great Bear or Charles's Wain.

I need not at this day remind you that progress in any one science depends on what may be called the accident of progress in ancillary sciences and arts. I have always thought it a remarkable instance in this sense that the stupendous advance of modern surgery waited upon two main conditions, namely, on the discovery of anæsthetics and on those researches of Pasteur which laid the foundation of modern bacteriology. When I was a boy surgeons operating upon the quick were pitted one against the other like runners on time. He was the best surgeon, both for patient and onlooker, who broke the three-minutes record in an amputation or a lithotomy. What place could there be in record-breaking operations for the fiddle-faddle of antiseptic precautions? The obvious boon of immunity from pain, precious as it was, when we look beyond the individual, was less than the boon of time. With anæsthetics ended slapdash surgery; anæsthesia gave time for the theories of Pasteur and Lister to be adopted to practice. It is within the memories of some of us how the great performing surgeons scoffed at Lister's first essays—happily this great man has lived himself to see his own splendid vindication. How the improvement of the microscope lifted physiology and pathology into new realms of discovery is a familiar story, but one perhaps not fully comprehended by those who have not learned how the want of this instrument arrested the work of Harvey in his labors on the problem of generation, as well as on the circulation of the blood; or, on the other hand, how its use by forwarding the work of Bichat founded modern physiology afresh; how by the microscopic discovery of the human egg the mystery of generation was unveiled by v. Baer in 1827; how by forwarding the work of Schleiden and Schwann the realm of the cellular pathology was opened out, afterwards to be cultivated so successfully by Virchow.

Illuminated by such cross-lights new fields of clinical medicine, which on the old method of Hippocratic observation Sydenham had carried perhaps to its extreme limits, stood revealed by the labors of the great French school of Laennec and Magendie, of Louis, Andral, Cruveilhier, Trousseau and Charcot. Laennec gives me the impression of being one of the greatest physicians in history; one who deserves to stand by the side of Hippocrates and Galen, Harvey and Sydenham. But without the advances of pathology Laennec's work could not have been done; it was a revelation of the morbid anatomy of the internal organs during the life of the patient.

It were too long a task for us now to turn to other fields to note how the discoveries of the great chemists of the last two generations threw light upon pathogeny; how those of the biologists gave a new meaning to the study of human morphology. You know already how natural knowledge advancing from many quarters was extended, and especially in the realm of medicine which we are now contemplating. Each great branch of natural knowledge has its own *Hinterland* which it surveys for the common good. Nor shall we forget that a like activity in other departments of human intellectual enterprise has enlarged the conceptions of physicians even where the facts stood aloof from their ordinary conversation. As Locke and Hume told for medicine in the eighteenth century, if indirectly yet none the less enormously, so in our own century Lyell, Darwin, Spencer and others, by profoundly modifying the whole attitude of our minds towards Nature, have given to physicians a new standpoint from which to survey their particular world.

It would now seem that even in medicine the experimental method, which seemed forbidden to her, is making its way after all. If pathology never can become a science of direct experiment in the sense that physiology is so, it makes use of it as a second line of advance. If we cannot produce a pneumonia we can study the results of cutting a nerve. In physiology the number of variables is embarrassing, yet in medicine it is far greater. No two cases of a disease are alike—temperament, race, season, circumstances, all variables, conspire to modify cases and inferences. It will always, indeed, be impossible in any branch of the biological sciences to isolate conditions and to repeat them as in chemistry and physics. Yet, as I have said, an approximation to such means is manifested in the bacteriological laboratory where pure cultures are separated, their toxines tested in proportion to body weight, antitoxins calculated, and immunities predicted.

It would seem to be, in the study of immunities, that the physician will first attain the reward of scientific research in prediction. A science which cannot predict quantitatively is in an inchoate stage. Multiplication of corpuscles, like the increase of cell growths in a hypertrophied heart or kidney, is but a case of compensation—a measure of resistance to disturbance.

Whether we regard it from the static or the dynamic point of view, the conception of the vis medicatrix naturæ gains newer force every day. Our blood and other corpuscles are microbes, their serums are factors in natural processes, and are regarded as healthy or unhealthy as they happen to be convenient or inconvenient at the moment of observation. Glands, such as the liver and kidney, are aggregations of microbes specialized for particular functions, and generate juices which are factors of nutrition, and not only of negative, but, as we have learned so well in respect of the thyroid, of positive influence in the balance of its manifold processes.

From experiment and observation we find that this reserve energy of the body in its various parts is enormous. How large is the view of the province of therapeutics thus presented to us we may see in the rapid advance of what I may call physiological remedies. As hygiene is to the state of health, so is physiological medicine to that of disease. By

physiological medicine I mean the use of the ordinary functions of the body in counteraction of contingent or inherent perils.

It is a common but I think a shallow reproach to modern medicine, that, with all the advance of our knowledge of pathology, therapeutics stands where it did in the time of our fathers, or has even fallen back, in so far as a certain sceptical distrust of empirical remedies has discouraged the continued use of remedies which the wisdom of our fathers had discovered by practice and observation. It is said that we will not use the most respectable of traditional remedies unless we have some notion of its mode of operation. It is possible that the invaluable work which a scientific scepticism has done for us, not in therapeutics only, has been attended by some destructive effects which are to be regretted. I think, however, it would be difficult to bring forward many instances of the kind in our own case; while, on the other hand, the pruning and clarifying which our practice has undergone far outweigh any such temporary disablements. The truth is that the cry itself is a shallow one. I will not stay to assert that modern surgery, the brilliant progress of which is in all our mouths, is progress in therapeutics, the division between surgery and medicine being a division of convenience, a division to which a mere practical and temporary usefulness only is to be attributed. Are we to forget, for instance, how the prognosis of peritonitis, of obstruction of the bowels, of pleuritic effusions, of encephalic tumors, of perityphlitis, of pelvic diseases, of ovarian ascites, and so forth—a prognosis in troops of cases turned from sadness to hope—is not to be called progress in therapeutics because not infrequently the method is carried out by the skill of another hand? It might as well be asserted that the modern scheme of feeding in fevers, because it is carried out by trained nurses, is no therapeutical progress. Nor will I admit, even in the sphere of drug therapeutics, that our progress is contemptible.

When we regard the additions made to our hypnotics, the discovery of the value of the nitrites, of the bromides, of arsenic in pernicious anemia, of the salicylates, of the antipyretic, hypnotic and antalgesic group, of the antiseptic treatment of diseases of the skin, of the antitoxic treatment of diphtheria, of the thyroid treatment of myxœdema; when, again, we realize the greater precision of our use of the older empirical remedies, as of digitalis, in the preciser administration of remedies in syphilis, in the injection of alcohol and ether, of apomorphine, of ergotine of strychnine, of hyoscine, of cyanide of mercury; when, once again, we think how much more accurately we discriminate our means in the treatment of phthisis, of dyspepsia, of fevers, of palsies, central or peripheral, we may confidently take encouragement and meet those adversaries in the gate who say that therapeutics has made no considerable progress. At the same time, we may well take to heart the lesson which such criticism may teach us. While we have learned that empirical knowledge, although a power against ignorance, is of less avail against the more ordered and living knowledge of a maturer science, on the other hand, for this very reason, we are now, perhaps, apt to despise unduly the traditional remedies which rest their claims to usefulness more on empirical than on reasonable grounds. For in the use and practice of all methods we must remember that medicine is an art, that it is something more than an applied science.

Our art has always been, and probably long must be, in advance of scientific direction and explanation. Moreover, as in all arts, more than knowledge is needed, namely, common sense, rapid and firm decision, and resourcefulness—faculties by no means resting upon intellectual conceptions, but on a certain virility of character not to be got from books. It is no uncommon experience to see physicians of high intellectual subtlety, of great learning and of a pretty wit, lose themselves in the practice and even in the exposition of their profession, because in them the critical faculty exceeds the practical. Indiscriminate doubt, however valuable an attitude of mind in the laboratory, is mischievous in the field of action, where a keen determination to make the best of imperfect instruments, to use any accredited means rather than none should be the dominating impulses—impulses which enlist also on the side of the physician the hope and animal spirits of the patient; for, after all, the practice of medicine contains no small element of "suggestion." Furthermore, the fastidious spirit, which I have endeavored to indicate, is, on the whole, opposed to progress, as, even in thought, it lends itself too readily to irresolution, and irresolution is the quick way to indolence. On the other hand, I need not warn you that practice without continual scientific re-edification soon degenerates into stereotyped and sterile routine.

Once more, when we are twitted with the discovery of manifold new diseases, without the discovery of any means of dealing with them, we may reply that not only are we discovering the course and ends of these destructions, not only are we discriminating between this series of symptoms of dissolution and that, but we are engaged, as I will remind you again, in the study of origins. We are no longer satisfied to contemplate the wreckage of disease, but we are earnestly hunting out the processes in which such and such deviations from health took their being.

The study of origins, then, is not only the new method of modern criticism, of modern history, of modern anthropology, of our reading of the evolution of the universe itself from elements which even themselves are falling under the same analytic inquiry, but the study of origins is leading to a revolution in our conception of therapeutics, as of all these other studies; a revolution which as yet we have not fully understood. This revolutionary conception is that death is not to be driven away by the apothecary, not by any cunning compilation of drugs, but is to be prevented by the subtler strategy which consists in knowing all the moves of the game. Few and simple are the diseases which can be expelled by leechcraft, as we expel a worm. The medicine of the future will consist in setting our wits to nature, in recognizing that when evils have befallen us there is no counsel, and that in the simple beginnings of things are the time and place to detect where stealthy nature, atom by atom, builds and unbuilds, feeds us or poisons us. To disentangle the clue we shall not pull at it anyhow; we shall anxiously seek the beginning of it, thence to unravel its windings.

There is an old saw that Nature takes as much trouble to

make a beggar as a king. She does not make diseases to sit so loosely that they can be expelled by violence or bound by a charm. Much of curative medicine, in the vulgar sense, will thus be swallowed up in preventive medicine. We shall not wait till we are half dead before we take in hand our disorders; abnormal processes, not their results only, will be our fruitful study.

Another feature of modern therapeutics is the use of Nature against herself. We learn, as I have said, to play the game; we are not content to sleep at our posts till we must fight desperately, against a checkmate, but we keep in touch with the enemy all through, and use the same means. Thus, by the side of preventive medicine, we learn that hygiene, in its largest sense, is also to be our guide. Instead of trusting to prescriptions for alleged specifics, which have no little kinship with magic and antidotes, we ally ourselves with Nature's own forces. For example, if we cannot prevent infantile palsy, which soon, perhaps, we may do, we shall attempt its cure, not by idle drugs, but by strengthening the physiological factors of life; by the use of massage, electricity, warmth, and so forth. As we further discover the physiological factors of life, we learn to supplement the failing juices of a gland from other sources in the economy; by learning the distribution of heat in the body, we find that fever can be controlled by conductions of heat by cold baths and otherwise; by a better knowledge of the mechanics of the circulation, we arm ourselves with means for regulating its currents by baths and gymnastics and the like. Even in the sphere of drugs themselves we are, year by year, deposing this drug and that from the place of specifics, as in the case of quinine, and putting them in the ranks of preventive agents, and, with respect to others, we are carrying our study of origins into their qualities, as well as into the healthy or morbid processes over which they have power. The relation of atomic weight to physiological effect, the experiments by which, on slight substitution of one molecule for another, we convert compounds from one kind into another and widely diverse kind, from convulsants, for example, into narcotic or paralyzing agents, we throw light not only on their own properties but also on the secret processes of the animal body itself. I will not stay to illustrate in the same way the parallels between the members of different series, nor the advances, of late the least active, by the way, of physiological chemistry, and of chemotaxis, and of the study of the behavior of serums and the like within the more comprehensible range of the test tube. Such considerations impress us again and again with the importance of the union of practical and laboratory or theoretical work in the same person and in the same schools. No scientific observer who has not made medicine more or less a practical study can be as well equipped as otherwise he would be to investigate such subjects as these.

The modern hospital must be the modern laboratory of medicine. As in the sixteenth century the great laboratories of anatomy sprang into existence, in the seventeenth the laboratories of physics, in the nineteenth the chemical (Liebig), the physiological (Ludwig), the chemico-physiological (Hoppe-Seyler), the pathological (Virchow), the hygienic (Pettenkofer), so the clinical laboratories initiated but the other day in Germany by v. Ziemssen, Curschmann, and in the United States by Pepper, are the factories out of which the new medicine is to come—the medicine which, penetrating into the intimate processes of Nature, learns to turn Nature to her own correction. The clinical laboratory is to be the scene of the study of the origins of disease.

What are the aids and dangers of "specialism" in these advances? Against this tendency in modern studies and practice an outcry has been raised which, if a little unintelligent in its way of expression, has not been without justification. In advancing civilization the applications of thought, as well as those of labor, must be divided and subdivided. The activities of the mind are at least as multiform as those of the traveler in the world, and it is impossible for all explorers to follow each other over all ways. As pioneers increase in number and in adventure the more are they divided from each other, the more difficult is it for each to make himself master, even by report, of the work of all. This general law is as true for medical inquiry and for medical practice as for electricians or naval engineers. Not only so, but we may say that, in the sciences, men are not traveling over one world only, but over many. If within each world of mathematics, physics, chemistry, and so forth, explorers separate and travel out of sight of each other, what shall be said of the remoteness of explorers in these several worlds? Yet these several worlds of the sciences are not as Mars to us, but as the various kingdoms of the earth. What goes on in each is of the utmost importance to all, and as civilization advances becomes not of less importance, but of more and more. Herein lies the justification of what I have called the outcry against specialism. The protestants have perceived this inter-relation of all knowledge, and they have foreseen both the narrowness of spirit and the lameness of practice which must come of such a disintegration of parts of such an isolation of efforts. Nay, they may not improperly conceive that a less amount of knowledge, duly systematized, may be of more value in affairs and in philosophy than more knowledge in scattered parcels. If the outcry has been somewhat unintelligent, this has been not in the perception of the kind of injury to learning. This is to be credited to them as a virtue. But in the want of perception that some division of labor is inevitable, the protestants have seemed to care less for the advance than for the system of learning, and, indeed, to have set practice in some antagonism to learning.

We shall henceforth perceive, I trust, that this new movement comes from the deeps; that it is not by withstanding the very conditions of modern progress that we shall secure its balance, its concert and its sanity. Happily, evolution will be found still to consist not in differentiation only, but also in integration. As labor is divided, an organization of knowledge must proceed step by step with the division. Specialism will have its disadvantages, as all exclusive aspects of things have them. In practice, specialism will have its charlatanry, as omniscience has had it. It is only by the increase of discernment and education in society at large that the genuine and humble children of Nature will be known, and it is by progress in its best sense that such discernment and education are to be extended. I do not hesitate to say that even within

my own lifetime these qualities in the relation of society towards our profession have not only increased, but have waxed abundantly, and thus is a medium formed in which the remoteness and alienation of specialized workers finds a corrective. The worker in all subjects, even in the larger operations of ordinary trade, learns that he, too, must think of the whole as well as of parts and details. Even money cannot everywhere be broken up into small change; commerce can no longer be a piecemeal affair. In the tradesman, indeed, is engendered a mind in favor of breadth of view, and even in the man in the street is begotten a hazy notion that there cannot be, as in ancient Egypt, a physician for every part of the body. There is no mean in Nature but Nature makes that mean; if these qualities of intellectual concert, of scientific formation of mind, of breadth and sagacity are needed, they will be found, and the way to them will be found also. Indeed, such conceptions of education are gaining apace on the general mind, though their full bearing is not yet understood. It is this very breadth of mind which is aimed at by educational reformers, by those who prize education before mere acquisition, who assert that, with the greater complexity and definiteness of knowledge, associations of workers and certain harmonies in their results must be brought about.

Those, then, who resent the specialization of science, as of other fields of human work, although they are wrong in their way of opposition, have hold, nevertheless, of an important truth, and they agree with the Thracian King Zamolxis, who was also a god. Zamolxis observed that "as you ought not to attempt to cure the body without the head, or the head without the body, so neither ought you to attempt to cure the body without the soul, and this," he said, "is the reason why the cure of many diseases is unknown to the physicians of Hellas, because they are ignorant of the whole, which ought to be studied also, for the part can never be well unless the whole be well." (Charmides.) Although then we cannot hope that every physician shall be a man of science, we may secure that he shall have the scientific habit of mind, for thus, as we have seen, he will be habituated to lay out his knowledge systematically, to trace phenomena to their sources, and to see his own facts in their due relation to other facts. This is the philosophic temper which cannot be learned from books and rarely without tradition and converse with gifted men.

Some disciples are more apt to receive this grace than others; some men, many learned specialists, are incapable of wise scientific judgment; no examination can test it; no memory can secure it; it is in part a product of time, which accepts what is good and rejects that which is transitory. It is to be assimilated from organs of knowledge, such as universities, and not from mere polytechnic institutions. It is the highest reward of the teaching from a living source, for, as Professor Butcher says, "the test of life is to impart life."

Too many students pass through their schools without an awakening of their minds. They believe their superficial knowledge to be exhaustive, and they become the mouthpieces of ready-made opinions.

I should be an ill bird were I to say anything to-day in depreciation of the value of lectures, of my own wares. In bygone times I have said much in depreciation of them, urging that they are survivals of a time when books were scarce and dear, and when knowledge was looked upon as spoonmeat. I have helped forward the cry that the laboratory must be the future living source of knowledge and of inspiration. While men were blind to this new truth it was necessary to urge it to the hindrance of other needs which men were not likely to forget. Now that the battle is won, and the laboratory is everywhere with us, we may turn again to consider what there is in older methods which we would not willingly lose. In lectures we may still find the virtues which flow from living converse with thoughtful men who have been over the field of our studies before us, who can show us how their minds worked, how they systematized their knowledge, how they came to see it in the light of other researches, how they inspired it with human interest. For such ends as this we must have no mere retail dealer in knowledge for our lecturer. In all universities it is now recognized that, except for tutorial work, the lecturer to beginners must be the leader in his faculty. He it is who can give the true first set to the thoughts of young men who are entering into the subject of their lives; older men and advanced work may well be undertaken by demonstrators.

Thus far I have considered specialism and breadth in respect of the education in our profession, but a larger problem lies before us, namely, that wider culture which lies beyond the confines of all professions. One of the difficult conditions of our own generation is the urgent pressure on young men and boys by reformers and anxious parents who desire, not unreasonably, to mold their sons into money-making machines at as early a date as possible. When I took my degree at Cambridge our course was, in the first place, to take an arts' degree, at that time only to be had in the arts. Thereafter came the natural-science studies, with their tripos, and after that again the clinical studies proper to our professional life. This course occupied us up to the age of twenty-five, at least, and in some respects it was a far better education than we now bestow. Now, from the first hour of the medical student's arrival in Cambridge he is too often turned at once into the narrower channel of his special calling, and he even tries to pick up a precarious instruction in clinical work while he is ostensibly at work on the preliminary sciences. Nay, such is the pressure of the times, parents and teachers are getting impatient even with this rate of speed, and are insisting that even at school time is wasted in classical and other broader studies which might be utilized for science, and that men should come up to the university ready to "specialize" farther still. Among other strong arguments in favor of this reform is this: That whoso means to practice surgery should acquire manual dexterity, and that this advantage cannot be acquired by the ordinary man unless he begin to educate his plastic fingers in early youth. This argument I will dismiss in a word by saying that, in my opinion, every man should be educated in a handicraft or mechanical art of some kind during his early youth. The importance of this element of education is curiously forgotten even by such a mechanical race as the English and American. So much for surgery; the boy who has learned to use a lathe or to make a chest of drawers will have fingers apt enough for surgery.

There is, moreover, another means of education most useful in early life, namely, that of measurement. At every national school youths of both sexes should learn to measure accurately to thousandths of an inch and to hundredths of a grain; thus the eye is taught with the hand, and, what is of more importance, the mind is trained to know what accuracy means. These occupations, invaluable in training of character and skill as they are, would add nothing to the burden on a growing brain.

Of the sciences, those of memory and observation only should have a place. The mind of youth is in a stage when the imagination, rather than abstract thought, should be cultivated. To collect natural objects, and thus to be drawn into the haunts of animals, into the habitations of plants, and to see the structure of the earth, excites and enlarges the imagination and strengthens the memory at a time when these faculties are ripe for culture. I have never happened to meet a young man, educated in abstract science at school, who seemed to me to have used his time to the best advantage. If, for the present, it has led to success in the narrowest sense, I think we are entering even now into a generation when success must be based on a larger education than this—on an education in letters and in the humanities, as well as in the laws of the material universe. Rousseau well said we should not teach children the sciences, but give them the taste for science.

We are apt to forget that even in these days of science, advancing by leaps and bounds, that still the greater part of man's life is spent in the expression of his thoughts and in converse with mankind. He should, therefore, have learned to handle the ideas which concern himself and his fellows, not only in their *material* conflict with Nature, but also in those higher spheres of history, ethics, politics and social aspiration for which alone man can be said properly to live. If we regard the mastery of modern man over Nature in any other light than as clearing for us a larger base for a reconstruction of societies which shall be more wise, more humane, more beautiful in spirit than in the past, there would be nothing but sadness in the contemplation of modern life, with its "gay afflictions, golden toil." No doubt we must rebuild our material home, but we ourselves also must be born again. (Newman).

The uses of learning Latin and Greek lie in this—that in these studies, more than in any others, the ideas which concern man in his highest endowments of mental, spiritual and social life are manifest, and not only so, but are manifested in languages the most virile and beautiful the world has known. Latin and Greek are called dead languages. If so, the Hermes of Praxiteles and the Venus of Milo are corpses. Latin and Greek contain in perfection of form not modern science, but that for which modern science exists—the best that man has lived and thought. It would be a narrow pedagogy which should assert that strong and penetrating thought, and noble and chastened imagination are to be found only in Latin and Greek; we may be thankful, indeed, that the English language is or has been as noble an instrument, and enshrines at least as fine a literature. Yet it has been said long before our time that to know one literature only is to wander in the sphere of letters without a scale of relative dimensions—to lose the faculty of comparison for lack of standards of comparison. To learn to speak a language like a parrot is but to train a mechanical memory. Latin and Greek, however, although they contain the finest records of human thought and action, are, as I have said, not the only shrines of letters, and the noble literatures of France, Germany or Italy may take the place of either of them, and carry the additional advantage of common usefulness.

But do not let us forget that our calling derives its honor not from its power of repairing the carnal body; were this its only title to respect it would take a low place in the hierarchy of professions. Those professions which deal with the ends which alone make life worth preserving—such as that of the law of religion, philosophy and of the fine arts—would in such case regard our occupation but as a higher kind of farriery. The glory of our profession, from the hour when Hippocrates, in that oath wherewith like a trumpet, the notes of which reverberate still through the ages, summoned us to take our place in the forefront of the fight, has been that we are concerned not only for mankind, but for men. The ideal side of a physician's life is that he brings healing or solace to his human fellow. The Greek philosopher, like the modern socialist, would sacrifice man to the State; the priest would sacrifice man to the Church; the scientific evolutionist would sacrifice man to the race. Yet, while all these elements of co-operation and of aspiration work together for good, we thankfully see that, after all, the tendency of civil evolution, as of Christian ethics, is to use society as a means for man himself, as a means to purify and to elevate the individual soul. The physician, then, is more than a naturalist; he is the minister not only of humanity at large but of man himself. Thus it is that the humblest of us, and he who labors in the darkest and most thankless parts of our cities, is never a drudge; in the sight of the angels he is illustrious by the light of his service to men and women. The man of science can tell us delightful things about birds, flowers and wild life, for all life is various and touching; he can tell us queer and uncomfortable things about our insides, amazingly useful things about steam and electricity, but at bottom, when the marvel is over or the material gain is won, all this grows stale. Ideas concerning the harmony of the spheres, concerning cosmic evolution, concerning the inhabitants of Mars, are prodigious; they may uplift us sometimes with a sense of the greatness of man's inheritance, but alone they are cold and unsatisfying. The child of his age feels that a sonnet of Wordsworth, a flash of Browning's lamp into man's heart, an idyll of Tennyson give us thoughts worth more than all the billions of whirling stones in the universe. In strengthening and cherishing this inner life of his brother and sister, happily, the physician has many fellows, but the physician alone among them all holds sacred the lamp of the personal life for its own individual sake; he alone forgets Church, State, nay, even the human race itself, in his tender care for the suffering man and for the suffering woman who come to him for help.

ON REFRACTORY SUBCUTANEOUS ABSCESSES CAUSED BY A FUNGUS POSSIBLY RELATED TO THE SPOROTRICHA.

By B. R. Schenck, M. D.

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On November 30, 1896, A. W. presented himself at the surgical clinic of the Johns Hopkins Hospital with an infection of the right hand and arm of an unusual nature. The primary point of infection was on the index finger, whence it extended up the radial side of the arm, following the lymph channels, and giving rise to several circumscribed indurations, which were in part broken down and ulcerated.

One of these indurated areas was incised, and deep in the tissues a thimble full of gelatinous, puriform material was found. A culture from this fluid was made on gelatin. At the end of four days there was a growth of the staphylococcus epidermidis albus, besides which several other distinct, white colonies, raised from the surface of the medium appeared. Cultures made on agar from the latter colonies showed after three days in the thermostat, an abundant growth of an organism, not resembling the bacteria and evidently present in pure culture.

On December 7, under aseptic precautions, an indurated area just above the elbow was incised, and a small piece of tissue removed for microscopical examination. Two cultures were taken on slant agar from the puriform contents of this nodule. In three days both tubes showed a growth in pure culture of the peculiar organism previously obtained.

On December 14, Dr. Finney made the following note: "Ulcerated area, size of finger nail, over dorsal surface of second joint of index finger—right hand. Edges much undermined. Sero-purulent, gelatinous discharge on surface. A second, similar ulceration between second and third metacarpal-phalangeal joints. An indurated line, 1 to 1.5 cm. in diameter, follows along dorsum of hand and forearm, with here and there ulceration.

On the arm there are two indurated points, which have been excised, the highest one being in the middle of the arm. At the junction of the upper and middle thirds of the forearm there is an indurated spot, the size of a bean, situated to the outer side of the main line.

Epitrochlear gland not involved. Axillary glands palpable, but not especially enlarged."

Dr. Finney then removed with aseptic precautions a second, larger piece of tissue for microscopical examination.

The patient gave the following history: Age 36. Marked family history of tuberculosis. Patient has suffered from phthisis for past twelve years.

During the latter part of August, 1896 (3 months before visit to the Johns Hopkins Hospital Dispensary), while working at the iron worker's trade in St. Louis, the patient scratched the index finger of right hand, on a nail, while reaching into a red lead keg. Shortly after this a small abscess formed which was opened with a pin. A slight amount of watery fluid escaped, which patient thinks did not look like pus. In about three weeks the ulcer between the second and third metacarpal-phalangeal joints appeared. This was treated at the St. Mary's Dispensary (St. Louis). The inflammation traveled up the arm, and in about seven weeks after the infection seven similar abscesses had formed. These were opened, and a watery discharge escaped. About this time a "waxen kernel," size of a walnut, appeared in the axilla. It was not especially tender and disappeared in two days. While in St. Louis the arm was bandaged daily with bichloride and carbolic dressings. The patient thinks that he had no fever, and says the pain was very moderate. Being unable to work he returned to his home in Baltimore late in November.

Physical examination on entrance showed evidences of advanced tuberculosis of the lungs, and the sputum contained numerous tubercle bacilli.

The infection involving the hand and arm proved very refractory to treatment, the last lesion, at point of primary infection, not granulating until late in February, 1897.

The organism which was assumed to be in etiological relationship to the above-described lesions was obtained in three cultures from two different foci of the disease: Once from one of the lesions in the forearm, admixed with the skin coccus, and twice from one of the lesions in the arm, in pure culture.

Cultural Characteristics.—Cultures were made on all our common media, including plain, glycerine and sugar agars, plain and sugar bouillon, plain and acid gelatin, milk and potato. With the exception of the milk all the cultures developed luxuriantly.

Agar.—At 37° C. the growth is first apparent at the end of 48 hours, when the tract of the needle is marked by a faint line, slightly opaque, which under a low magnifying power is seen to be made up of minute colonies, with feathery outline, resembling somewhat minute snowflakes. At the end of 72 hours, the line of inoculation is sharply marked by an opaque, white, moist growth, having well-defined edges, raised from the surface of the media. Here and there at the periphery are isolated colonies. As the age of the culture increases—about five days—the growth extends very much in thickness and but little peripherally. The surface is corrugated, the edges lobulated and sharply defined (Plate I, Fig. b).

In cultures of ten days and older the growth is very thick; the surface is rough, corrugated, and stained a dark brown color, the shade at the periphery being deeper than in the centre. The medium also becomes stained.

Colonies of three days appear to the naked eye as round, raised, moist dots, 0.5 to 1 mm. in diameter. Under the low power they appear to be made up of a feltwork of minute fibrillæ, dense in the centre, lighter at the periphery, with a feathery outline. Scattered through this meshwork are many minute dots, consisting of the conidia.

Colonies of ten days are characteristic. They are round, sharply circumscribed, and elevated from the surface of the medium. The surface of the colony is brownish, and marked

by radiating lines proceeding from centre to periphery, evidently caused by the drying and shrinking of the growth (Plate I, Fig. a).

By a comparison of the development on glucose, lactose and saccharose agars, little difference is to be made out during the first two weeks. In cultures older than 14 days, however, the growth continues longer and becomes heavier on glucose than on plain agar, and in all the sugar media there is more discoloration both of the growth and of the substratum.

Gelatin.—The growth in stab cultures develops slowly. It is much more abundant in the upper part and spreads laterally over the surface, while the development in the depth is feeble, being scarcely perceptible in the lower third. At the end of six days there is slight liquefaction of the medium. The organism grows somewhat more luxuriantly in acid gelatin, and the liquefaction is greater.

Bouillon.—Growth in bouillon is fairly abundant in three days, and appears as little, cottony tufts which settle to the bottom of the tube, leaving the supernatant fluid perfectly clear. As growth proceeds, it tends to spread up the side of the tube. The reaction of the bouillon is not altered.

Potato.—At the end of 48 hours the growth is abundant. It is elevated, the surface is moist and the edges lobulated. After several days the surface of the growth becomes rough and wrinkled, the edges discolored and the potato darkened.

Milk.—There is no change produced in the tint of litmus milk at the end of seven days, and no coagulation takes place. The organism does not seem to thrive in this medium, film preparations showing only very small numbers.

Fermentation Tests.—Stab cultures in glucose, lactose and saccharose agars show no gas bubbles. Glucose, lactose and saccharose media, made from sugar-free bouillon, prepared according to the method of Theobald Smith, placed in fermentation tubes, give an abundant growth in the aërobic bulb, the anaërobic tube remaining clear. There is no gas formation.

Relation to Oxygen.—No growth develops in culture placed in the Buchner jar.

Vitality.—Growth which has remained on potato for eleven months again develops when placed in sterile bouillon. Agar cultures retain their vitality for at least nine months. To test the resistance to low temperatures, portions of growth from bouillon were placed in sterile water and allowed to remain in cold storage, at a temperature of 28° F., for ten weeks, after which they proved to be alive. In these cases actual congelation did not take place. When frozen for this length of time, however, they lose their vitality.

The vitality of cultures is destroyed by exposure to a temperature of 60° C. for five minutes.

The optimum temperature for development is between 20° and 37° C.

Morphology and Development.—For many of the points relating to the morphology and development of the organism, I am indebted to Dr. Erwin F. Smith, of the United States Department of Agriculture, Washington, who has given much time to the working out of the more difficult and obscure points pertaining to its life history and classification. I take this opportunity of acknowledging the great value of his help and advice, and of expressing my appreciation of his kindness.

Cover-glass preparations made in the ordinary way, from agar and bouillon cultures, show two forms: (1) a thread-like, branching form, or mycelium, and (2) oval, spore-like forms, or conidia. In an unstained specimen the mycelium is seen to be made up of a doubly contoured thread, branching irregularly, but not very profusely, and never dichotomously. The protoplasm appears granular. The diameter of the threads presents considerable differences, with an average of 1.5 to 2 microns. The conidia are elliptical or ovate, many of the latter forms being distinctly apiculate. They are also doubly contoured and granular. The spores from the solid media are rounder and smaller than those developing in bouillon. They vary in length from 3 to 5 microns.

The organism stains well in all the basic dyes, and is not decolorized by the Gram method. Stained preparations show marked irregularities in the coloring, especially of the mycelium. The conidia frequently show a small unstained area near the smaller pole of the spore.

In smears made from agar or bouillon it is not possible to determine the relation which the conidia bear to the mycelium. Occasionally, however, one or two spores are seemingly attached by the smaller end to the side or end of the mycelium. This relation can be much more clearly brought out by observing their development in hanging-drop cultures, the description of which I quote from Dr. Smith's report of April 13th. The drawings are also reproduced from Dr. Smith's sketches. "When a little of the bouillon containing the colorless, elliptical or cylindrical conidia was inoculated into hanging drops of alkaline beef broth, and set away under a moist bell jar for forty-eight hours, there was an abundant growth of the fungus, the spore-bearing branches of which, being undisturbed, retained their spores in the normal condition, and the appearance of the fungus under such conditions is shown in the sketches (Figs. 1 to 3). Here from three to six or more spores were to be found, quite commonly clustered at the tips of the spore-bearing branches. Naturally, if the fungus had been disturbed by shaking or lifting out into a drop of water, most of these spores would have been readily washed away, leaving only one or two, that is, leaving such appearances as are shown on the drawings made directly from the bouillon cultures" (Figs. 4 and 5).

The life history of the organism was studied from bouillon cultures and from hanging drops. The conidia germinate by sending out one or more straight, unbranched germ tubes, sometimes from the end, again from the side. These germ tubes give off spores of the same character, the attachment being either terminal or lateral, by means of short pedicles or sterigmata (Figs. 6 and 7). Other seemingly similar spores push out into the branched mycelial forms, which in turn produce a new generation of conidia.

The existing classification of the fungi is a purely artificial one and is incomplete in many particulars. On this account it is often very difficult to determine where an organism is to be classed. Dr. Smith has kindly gone over the points in

regard to the classification of this organism, and his conclusions are as follows:

"It is a conidial fructification only, and on this account it is impossible to give more than a guess as to its position in the natural system of classification. To determine this the perfect spore form would have to be obtained. It can only be put into a form genus, in other words, into some artificial system of classification, until the natural one is known. It seems to me that it might be classified in either of these genera, according to the system given in Saccardo's *Sylloge Fungorum*, which is the commonly accepted standard of the artificial classification.

(1) It is not unlike the *Botrytis bassiana*, the muscardine, or calicino disease of silk-worms, and might therefore be regarded as a Botrytis. Against this classification, however, it is the fact that the spore-bearing branches are not erect, which is a rather trifling distinction. It might also be classed as (2) *Sporotrichum*, but inasmuch as it becomes dusky when it is old it might also be classed as (3) *Trichosporium*. Saccardo separated out the dusky forms of Sporotrichum into a separate genus under this name. The mere difference in color, as we know from cultures of many fungi, is often a very trifling matter, the early stages of a fungus often being white and the later stages dusky or even brown. On this ground I think that his distinction is of no value, and I think that we may throw out the genus Trichosporium altogether. As regards the other two, my own judgment would be that it fits best into *Sporotrichum*. In his *Sylloge Fungorum* Saccardo describes more than one hundred species of *Sporotrichum*, but most of them are described very imperfectly, and I cannot identify this fungus as belonging to any one of them."

The tissues removed for microscopical examination present the characteristics of a chronic abscess, consisting of inflammatory and cicatricial tissues. On the inside is a layer of necrotic material, next a zone of leucocytes, and outside newly-formed connective tissue, in which are several minute secondary abscesses.

Numerous sections stained by the Weigert and Gram methods failed to reveal any micro-organisms whatever. Sections stained for the tubercle bacillus by the carbol-fuchsin method were also negative.

Animal Experiments.—4 dogs, 6 guinea-pigs, 1 rabbit, 1 wild mouse and 2 white mice were employed. The results were as follows:

Dog I. The external jugular vein was opened, and 1 cc. of a suspension in salt solution of the organism was introduced. The dog remained well, and was killed on the 30th day. Nothing unusual was made out at the autopsy. All cultures were negative. The microscopical examination of the organs revealed nothing abnormal.

Dog II. Inoculated subcutaneously on the abdomen with 2 cc. of a 36-hour plain bouillon culture. On the next day there was an induration at the point of inoculation, followed in 24 hours by the formation of a tumor about 3 cm. in diameter, which on palpation gave evidences of fluctuation and tenderness. This remained practically unaltered for ten days, and then gradually became smaller and firmer to the touch. The dog remained apparently well, but was killed on the 28th day. Nothing was made out in the internal organs, and cultures from these were all negative. The tissues around the point of inoculation were excised and found to consist of firm scar tissue, in the centre of which was a small cavity containing a few drops of a gelatinous fluid. Agar tubes, inoculated with several loops scraped from the walls of the cavity, showed on one six colonies and on the other eight colonies of the organism. Bouillon cultures were also positive. However, no organisms could be demonstrated in cover-slips.

Microscopical sections through the wall of the cavity showed advanced cicatricial tissue. Numerous sections, stained according to the Gram and Weigert methods, failed to reveal the organism.

Dog III. Inoculated subcutaneously over the abdomen in a manner similar to Dog II. A second series of injections was made over the thigh in order to ascertain whether or not enlargement of the inguinal lymphatic glands would follow. Induration developed at the points inoculated, followed in two days by fluctuation and tenderness, the process increasing until the end of the first week, when the tumors became firmer and smaller. At no time were the inguinal glands palpable. Dog killed on the 21st day. The internal organs appeared normal; cultures from them remained sterile. Microscopical examination of the organs negative. At the local lesions nodules of fibrous tissue, containing small cavities similar to those in Dog II, were found. These little pockets contained a scanty amount of gelatinous material.

Smears from the cavities were negative.

Cultures from both lesions were positive, the organisms being rather few in number. They were, however, more abundant than in cultures from Dog II.

Microscopical examination of the fibrous tissue revealed the same condition as already mentioned and micro-organisms could not be demonstrated.

Dog IV. Inoculated subcutaneously in a similar manner, the induration and swelling took place as before, and on the fourth day, when the process seemed to have reached its height, the lesion was excised. The nodule was larger and less firm than the preceding ones, the cavity was greater and was completely filled by a thick, yellowish-red, gelatinous material, smears from which showed fibrin and red-blood corpuscles in small amounts, large numbers of polymorphonuclear leucocytes and a few objects similar in size and shape to the conidia characteristic of the organism introduced. None of these bodies were seen in leucocytes, all being extracellular.

Cultures from the walls of the cavity showed a very abundant characteristic growth of the organism.

Microscopical examination of the excised tissue shows the lesion to be a focus of inflammation. The walls are made up of the subcutaneous areolar tissue, forming a loose meshwork, the spaces of which are filled with coagulated albuminous material and leucocytes. The pus cells also infiltrate the connective-tissue stroma. At the edges of the cavity the connective tissue is denser and the infiltration of the leucocytes more marked. The cavity is lined by a mass of coagulated serum and necrotic pus cells. In specimens stained with hæmatoxylin and eosin, it is not possible to make out the organisms; but sections

stained by the Weigert method reveal them in large numbers, situated principally between the inner layer of cell detritus and the adjoining zone of infiltrated connective tissue which forms the wall of the cavity. For the most part they are associated in clumps of from six to thirty elements, but many occur singly and in groups of two or three. They occur mainly close to the edge of the cavity, but now and then may be situated singly or in clumps in the connective tissue stroma.

The organisms are of irregular shapes and sizes. In form they are round, oval and club-shaped, the last predominating. The smallest round forms are from one to two microns in diameter, while the long, club-shaped forms vary from two to four microns in length. These club forms are of irregular diameter, swollen at one end and tapering at the other; the staining is slightly irregular, there being often a small area near the centre taking the stain less intensely. The oval and round appearing forms correspond in size to the varying diameter of the club forms, and give one the impression of being cross-sections of the latter. These organisms are frequently seen within the bodies of both leucocytes and large connective-tissue cells. Many, however, are extracellular (Plate II, Figs. 1, 2, 3).

In the dog then, the inoculation of fluid cultures, either intravenously or subcutaneously, produces no evident constitutional symptoms and no internal pathological changes. When introduced subcutaneously there is a local lesion at the point of inoculation, consisting of a circumscribed inflammation and abscess formation. When allowed to remain for from three to four weeks absorption of the contents of the abscess takes place, and a mass of scar tissue containing a small cavity alone remains. In the cavity organisms are present probably in very small numbers as is shown by the failure of cover-slip preparations and the small number of colonies developing in cultures.

If, however, the nodule is excised at the height of the process, signs of active inflammation are obtained—an exudation of serum and white-blood corpuscles having taken place, as well as an infiltration of the adjacent connective tissue with leucocytes. The micro-organisms are abundantly present, being seen in cover-slips, and developing luxuriantly upon cultures, while sections from the lesions stained by the Weigert method reveal them in large numbers.

Rabbit.—One rabbit was inoculated intravenously with 1 cc. of a 36-hour plain bouillon culture. The animal developed no evident symptoms and remained apparently well for five months.

Guinea-pigs.—Six guinea-pigs were inoculated without result. In three the organisms were introduced subcutaneously. No induration followed at the point of inoculation. In three the inoculation was into the peritoneal cavity. No appreciable symptoms resulted. Five of these six animals died at periods ranging from six days to seven weeks after the inoculations, but in none was anything to be seen at autopsy, and all cultures from the organs were negative. At the time of these experiments numerous guinea-pigs kept at the pathological laboratory died of some unknown cause, and apparently the death of these animals was not due in any way to the organisms introduced.

Mice.—White Mouse I. Inoculated subcutaneously with 0.3 cc. of a suspension made in sterile bouillon, from agar growth. On the second day the mouse appeared ill, sat in the corner of the cage, refused to eat and scarcely moved when the cage was shaken. Death took place on the sixth day. At the point of inoculation there was an area 0.5 cm. in diameter, raised, soft, and gelatinous in consistency, and paler than the surrounding tissues. This involved the subcutaneous tissue and muscle. On section the intestines were hæmorrhagic and the spleen enlarged. The other organs appeared normal.

Smear preparations from the point of inoculation showed abundant oval and long forms of the micro-organisms, the latter varying from two to four microns in length. These stain irregularly, having usually a more or less clear area at one end. The same forms were present in smears from the lungs and liver, but in much smaller numbers. Those from the peritoneal cavity, spleen and heart's blood were negative.

Cultures from the local lesion, lung and liver showed the micro-organism in pure culture. The culture from the spleen was contaminated, while those from the kidney and heart's blood remained sterile.

Microscopical examination of the tissues.—Point of inoculation. The subcutaneous connective tissue is infiltrated with large numbers of the organisms situated in clumps, some around the blood-vessels, and others having no apparent relation to the blood-supply. The leucocytes are fairly abundant, and often contain several organisms within their protoplasm. Numerous larger phagocytic cells appear. Deeper down in the tissues the organisms are very abundant, and lie in large masses between the muscle bundles. The organisms do not invade the muscle, and there is no apparent increase in the muscle nuclei. Sections stained in hæmatoxylin and eosin show hyaline degeneration of the muscle fibres.

Liver.—In the liver many organisms appear in the larger blood-vessels and capillaries. Throughout the organ are minute focal necroses and degenerated liver cells, the organisms being in the capillaries of the diseased area and occasionally within the necrosed liver cells, and in leucocytes. The organisms have the same characteristics as those above described.

Sections of the lung and spleen appear normal except for the presence of the organisms in small numbers both within and without cells. They appear for the most part in small clumps containing numerous elements, but also occur here and there singly.

No pathological changes were made out in the kidney sections and no organisms could be demonstrated.

Lymphatic glands.—The lymphatic structures throughout the body showed the most striking and characteristic appearances. The organisms were readily demonstrable in the peribronchial, perinephritic and peritoneal glands, which contained immense numbers of them. They presented the same characteristics as before, and occurred for the most part outside of and between the lymphatic cells, although at times they are seen within the cells (Plate II, Fig. 4).

White Mouse II. Inoculated in a manner similar to Mouse I. Death occurred on the 10th day. The autopsy revealed

the same soft, semi-caseous area at the point of inoculation and a similar hæmorrhagic condition of the intestines.

The microscopical findings were the same as in the previous experiment.

Mouse III. A wild mouse was inoculated with 0.3 cc. of a 36-hour bouillon culture. Animal appeared to be unaffected until the fourth week, when it became less active and refused to eat. Died on the 38th day. Around the point of inoculation there was a very extensive induration, the tissues being hard, shrunken and dry. This sclerosed condition involved the whole posterior third of the back extending down the thighs and to the root of the tail. Internally the intestines were adherent and the testicles involved in the cicatrix.

Cover-slips and cultures were negative.

Microscopical examination of the tissues removed from the local lesion showed exceedingly dense scar tissue. No organisms were demonstrated. Examination of the organs was negative.

SUMMARY.

The condition in the human subject reported here seems sufficiently unusual to warrant publication.

It is further of interest in view of the evidence given, which would indicate that the skin abscesses and indurated lymphatic glands were due to infection with a micro-organism, differing markedly from the bacteria, but agreeing with certain of the fungi.

The cultural characteristics of the organism are similar to those of many fungi and yeasts, and the imperfect life history which could be determined renders it not improbable that it may belong to the genus *sporotricha*. But for the present the exact classification of the parasite must be left undecided.

The experiments upon the dog and the mice prove the pathogenicity of the organism, and indicate that, under different circumstances, it may remain local in its development and effects (dog), or it may invade the internal organs and produce a sort of pyæmia (mouse).

The etiology and pathology of many fungoid affections in man and animals receive a new interest in the light of the more recent studies of the pathogenic yeasts and their possible relation to tumor formations. It may be mentioned that the pathological conditions met with did not in any instance suggest any other than a simple inflammatory process.

I take pleasure in acknowledging my indebtedness to Dr. Flexner for advice and assistance in the course of the study recorded here.

EXPLANATION OF FIGURES.

Plate I.

Fig. a. Colonies of 10 days. Glucose agar. From lung of white mouse I.

Fig. b. Growth on glucose agar. 3 days. Photograph by Dr. J. F. Mitchell.

Fig. c. Cover-glass preparation from glucose agar. × 1000. Photograph by A. H. Eggers.

Figs. 1 and 2. Growth in hanging drop of bouillon. 60 hours.

Fig. 3. Same. 4 days. Reproduced from camera sketches by Dr. E. F. Smith.

Figs. 4 and 5. Cover-glass preparations from bouillon.

Fig. 6. Swollen and germinating conidia, from hanging drop of bouillon. 30 hours.

Fig. 7. Germ tubes with conidia attached, from hanging drop of bouillon. 3 days.

Plate II.

Figs. 1, 2 and 3. Sections of wall of abscess in subcutaneous tissue dog. Leitz obj. $\frac{1}{8}$ (Fig. 1), $\frac{1}{6}$ (Fig. 2), and $\frac{1}{12}$ (Fig. 3).

Fig. 4. Peribronchial lymph glands of white mouse. Carmine and Weigert's stain. Leitz obj. $\frac{1}{8}$ inch.

ŒDEMATOUS CHANGES IN THE EPITHELIUM OF THE CORNEA IN A CASE OF UVEITIS FOLLOWING GONORRHŒAL OPHTHALMIA.

Edward Stieren, M. D, *Pittsburgh, Penna.*

Oedema of the corneal epithelium with various changes and distortions of the epithelial cells due to pressure of fluid in the intercellular spaces, has been observed by many workers in the pathology of the eye, and has been described and depicted more or less thoroughly since Arlt's[1] original observations in 1855. He described the œdematous changes taking place in the corneæ of eyes affected with choroiditis accompanied by increased intraocular tension.

Fuchs,[7&8] Fridenberg,[6] Birnbacher and Czermak,[2] Klebs[12] and other observers have seen these changes occurring in glaucomatous and staphylomatous eyes.

Some experimental work has been done; Leber, Gutmann, and others have produced artificial œdema in the corneal epithelium. Leber[13] succeeded by injecting oil of turpentine under the anterior epithelium in producing, without any roughening of the surface, a corneal opacity which closely resembled the haze of glaucoma. On microscopical examination he found numerous vacuoles in different layers of the epithelium with a pronounced dilatation of the intercellular spaces. More recently, Gutmann[3] by injections of a solution of asphalt in chloroform, demonstrated a communication between the lymph spaces of the corneal matrix and the finer system of channels in the anterior epithelium, and produced a condition similar to that found by Leber.*

The corneal œdema of glaucomatous eyes (causing haziness and the appearance of rainbow colors around a flame at night)

*Bizzozero,[4] in his excellent article, first demonstrated the presence of a series of intercellular spaces or clefts forming a system of minute channels for transporting nutritive fluids to the individual cells and containing a small amount of viscid cement substance. Pfluger[14] and Gruber[10] have also described the nutrition of the corneal epithelium through these channels.

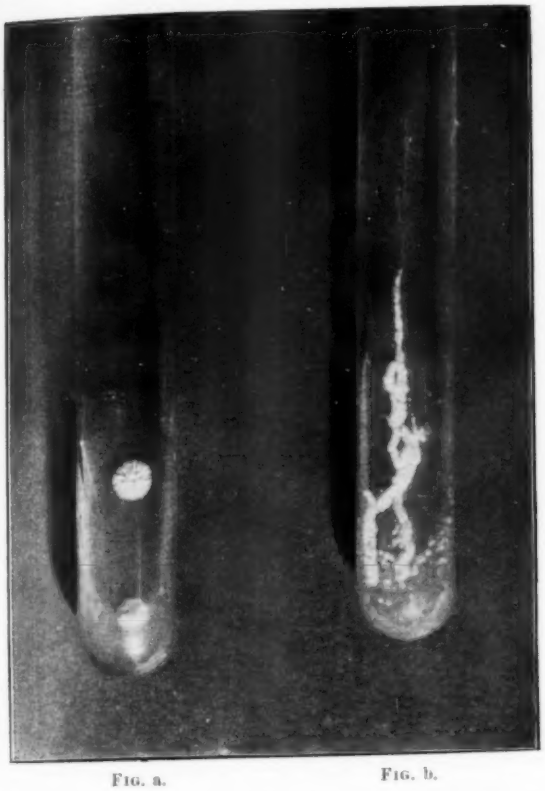
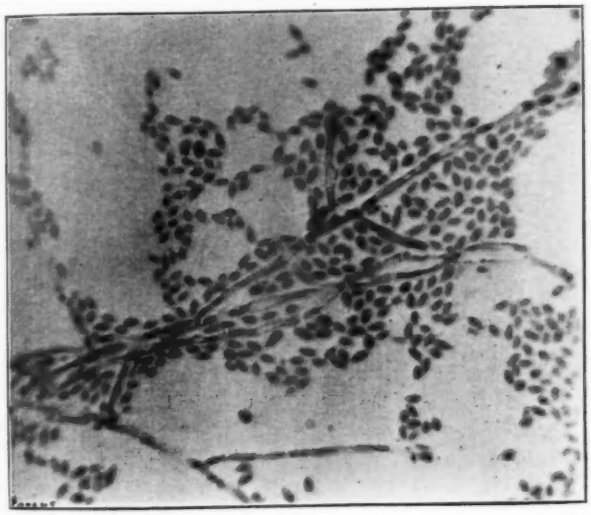


FIG. a. FIG. b.



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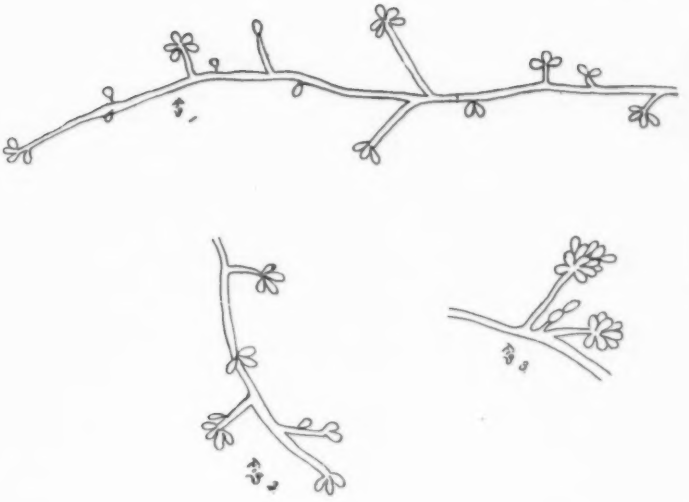

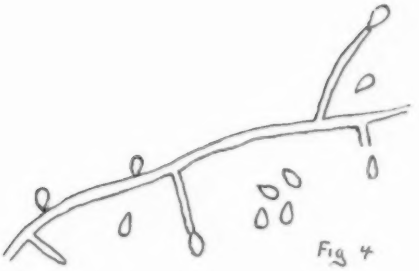

Fig 4

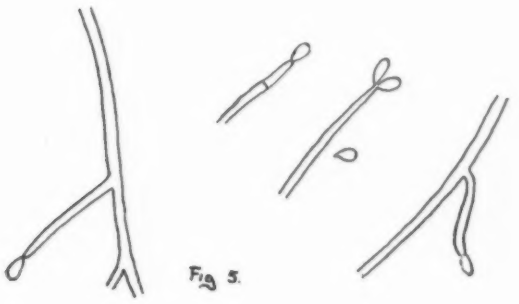

Fig 5.

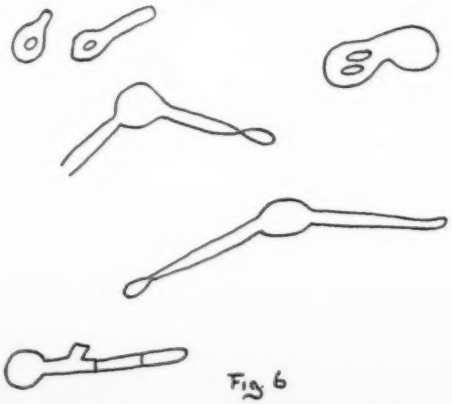

Fig 6

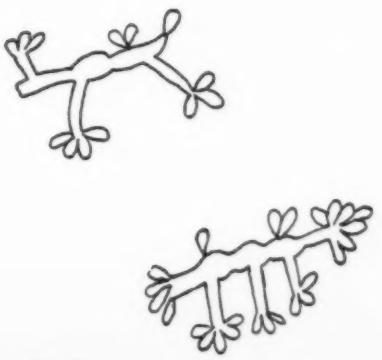

Fig 7

FIG. 1.

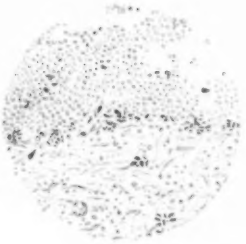

FIG. 2.

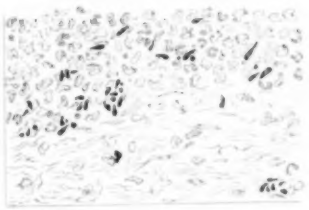

FIG. 3.

Sections from local lesion.—Dog.

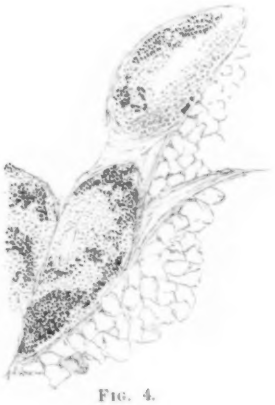

FIG. 4.

Peribronchial lymph glands.—Mouse.

is due to the increase in intra-ocular pressure, the tension of the tunics being suddenly or gradually raised, while the centrifugal flow of fluids is impeded or entirely shut off, resulting in an accumulation of fluid in these intercellular spaces. These are now transformed from mere channels into dilated lacunæ. This at least seems the most plausible theory, although Fuchs* thinks it possible that the œdema can be caused by pressure osmosis, the aqueous humor being forced by the intra-ocular pressure through Descemet's membrane (especially as this is often broken down in inflammatory glaucoma) into the corneal substance proper and thence through the lymph channels in the nerve sheaths and of the corneal matrix into the epithelial interce lular spaces.

In the case I wish to describe there is present an œdema causing marked changes in the epithelium which cannot be ascribed to increased intra-ocular pressure, since this was never present. Before entering into the microscopical appearance of the sections, a clinical history of the case is of decided importance, and is as follows:

John A., æt. 25 years. American; occupation, commission merchant, was first seen in June, 1894, confined to bed with gonorrhœal rheumatism and gonorrhœal ophthalmia of both eyes. The right eye was the worse of the two, the central part of the cornea at this time breaking down in an ulcer; the ulcerative process went on to perforation, allowing the aqueous humor to escape and the iris to come in contact with the cornea, when the ulcer finally healed over and left a central opacity, adherent to the iris and about 4 mm. in diameter. The treatment consisted in the application of 2 per cent sol. argenti nitratis, atropin, cold compresses to eyes continually, with the internal administration of salicylates. The disease in the left eye ran the usual course and made a good recovery without any corneal involvement. The patient was seen from time to time after this, and in March, 1896, he made his appearance with the right eye painful, and the left eye a little sensitive to light; inspection showed considerable ciliary injection of the right eye, the globe was tender to touch; an ophthalmoscopic examination was impossible on account of the adherent iris and corneal opacity. Enucleation was advised as sympathetic ophthalmia was feared, the inflammation extending, without doubt, along the entire uveal tract. The eye was removed shortly afterwards, that is about two years after the contraction of gonorrhœal ophthalmia.

MICROSCOPICAL EXAMINATION.

Sections through the limbus, cornea, iris and ciliary body show evidence of a marked inflammation involving all these structures. In addition to the changes in the corneal epithelium, which will be described below, the corneal matrix shows marked sclerotic changes, and numerous large blood-vessels coursing through it. The iris shows an acute inflammation as well as sclerosis, but in the sections examined it is nowhere adherent to the cornea. Between the iris and cornea there is considerable inflammatory exudate. The ciliary body shows marked sclerotic changes. The inflammatory processes, chronic and acute, are much more marked in one side of the eye than in the other.

The epithelial layer of the cornea is markedly thickened, the thickening being most pronounced at the limbus on the less involved side. For a distance of about 4 mm. from this point towards the other side the epithelium tapers down gradually and almost uniformly to the thickness of normal corneal epithelium. Although there is a slight hyperplasia present in all this area, the cells are larger than normal and there exists a certain dimness of outline in the individual cells, while their nuclei are swollen.

Beyond this point the cells begin to lose their characteristic appearance. At first this is most marked in the basement cells; their approximation is not so perfect, the intercellular spaces are dilated, the length of the cell is increased; the nucleus is pushed towards the top of the cell, while its base retains its normal attachment to Bowman's membrane. Here the more superficial layers are not much disturbed, except that the cells and their nuclei are slightly enlarged and the cell outline is not so sharply defined.

As we proceed across the field the above changes in the basement row become more exaggerated; the cells are drawn out longer and become narrower, while the position they formerly occupied is encroached upon by the dilating intercellular spaces. Their protoplasm stains lighter than normal. The more superficial cells are pushed forward. These changes become more marked toward the left (the more involved) side of the section, apparently due to persistent pressure of fluid. Round and oval vacuoles occupy in places the former sites of cells, now broken down. In some instances they contain broken down cell debris and degenerating nuclei.

These spaces occur for the most part in the basal layers ("Fusszellen" of Rollet and Lott), but are also present in the more superficial ones, a most interesting factor, however, being the manner in which the most superficial layer of cells remains intact under these circumstances. In several instances a vacuole extends from Bowman's membrane below to this superficial layer above, and this latter appears to be reinforced by a mass of broken down cell substance forced against its posterior border. Polymorphonuclear leucocytes appear in considerable numbers in the intercellular spaces in the more affected regions of the epithelium. When these spaces or vacuoles are not present the basal row of cells has the appearance of a uniform row of "palisades,"* while the cells above them and lying horizontally appear as rows of "arcades."*

Fuchs* observed that in glaucomatous eyes the vacuoles were most numerous at the points of nerve channel entrance into the basal row of cells. This cannot be demonstrated in the present case.

In the *substantia cornea propria* evidences of a most active inflammation are present. Round-cell infiltration is marked, with the formation of new blood-vessels in every field. Descemet's membrane for the greater part is intact though most of the cells are flatter than normal. Where it has broken down the sites are marked by the presence of numerous polymorphonuclear leucocytes.

The anterior chamber is filled with the coagulated remains of a thick fluid inflammatory exudate, dotted with mononuclear and polymorphonuclear leucocytes. The iris is generally infiltrated with round cells and polymorphonuclear leucocytes,

* Apt terms used by Klebs.[19]

and in areas there are vast accumulations of them. The blood-vessels are enlarged. The tissue elements are considerably broken down and contain much free pigment.

As we approach the ciliary attachment of the iris the round cells become more numerous and there is much thickening, due to new fibrous tissue. Schlemm's canal is much reduced in calibre by an inflammatory deposit on its interior, and surrounding it are numerous mononuclear and polymorphonuclear leucocytes. Between the fibres of the ciliary muscle and of the corneal matrix in this region there are deposits of fibrous tissue. These secondary inflammatory alterations are much more marked on the side in which the œdema of the cornea is found. To these alterations the œdema is probably due.

It seems not improbable that the lymph spaces conducting from the cornea into Schlemm's canal have been occluded either by the sclerotic changes in the tissues, by the accumulation of inflammatory exudate, or by mechanical pressure.

At any rate the absorption of corneal fluids has been checked in this region. A stasis in this locality would cause accumulation of fluid in the intercellular spaces of the epithelium.

In addition to the occlusion of the channels of absorption it is not improbable that another factor in causing the œdema has been the severe acute inflammation attacking the cornea and neighboring structures, and thus tending to cause an increased outflow of fluid from the blood-vessels. There is nothing to indicate, however, that the intra-ocular tension was at any time much increased.

In conclusion, I wish to express my gratitude to Dr. C. R. Bardeen for his timely assistance in preparing this article, and to Dr. R. L. Randolph for his careful review of the same. To Dr. Heckel of Pittsburgh, I am indebted for the clinical history of the case and for the specimen from which the sections were prepared.

DESCRIPTION OF PLATE.

FIG. 1. Zeiss, ocular 4, objective AA, 65 diameters.

Alcohol fixation, celloidin section, hæmatoxylin and eosin stain. The section passes through the cornea, sclera and iris near the corneal margin. In the corneal epithelium, represented at the right above, may be seen the œdematous spaces described in the text. The many blood-vessels passing through the substantia propria show the severe alteration which the main body of the cornea has undergone. The anterior chamber is filled with an inflammatory exudate. Inflammatory changes in the iris are obvious.

FIG. 2. Zeiss, ocular 4, objective DD, 370 diameters.

Alcohol fixation, celloidin section, stained with Bende's iron hæmatoxylin and with congo red. A vertical section passing through the corneal epithelium, from a region slightly nearer the centre of the cornea than that shown in Fig. 1. The marked alterations in the epithelial cells, described at some length in the text, are here clearly shown. A few leucocytes appear among the epithelial cells.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Meeting of November 7, 1898.

Primary Focal Hæmatomyelia from Traumatism. — Dr. PEARCE BAILEY, New York.

The definition was self-explanatory with the exception of the word *primary*, which was used by the author as indicating that the hæmorrhage was the result of force exerted directly upon the spinal cord without the intervention of a fracture or dislocation of the spine. Primary traumatic hæmatomyelia is thus differentiated from the hæmorrhages which complicate crushes of the cord brought about by compression. After a brief historical introduction, and after expressing the belief that this affection was more frequent than is generally recognized, the questions of causation, pathological anatomy, symptoms, diagnosis and prognosis were severally considered. With the exception of pistol-shot wounds, sudden flexions and extensions of the neck were the best established causes. The author believed the lesion was produced by an actual stretching of the cord, with resulting laceration of blood-vessels and to a certain extent of centrally situated nerve fibres; he rejected the explanation proposed by Thorbun that a momentary displacement of a vertebra was the immediate causative agent. The pathological anatomy of the condition consists in a focal hæmorrhage confined chiefly to the gray matter always in the cervical or upper thoracic region; the blood sometimes burrows for considerable distances up and down the cord. The extravasa-

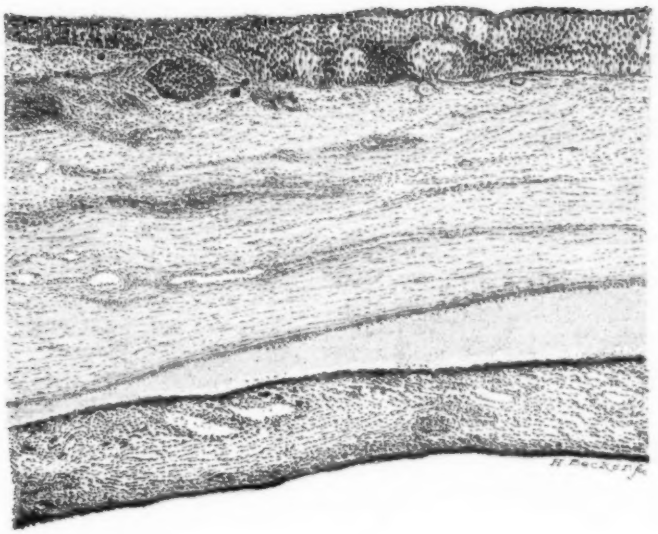

FIG. 1.

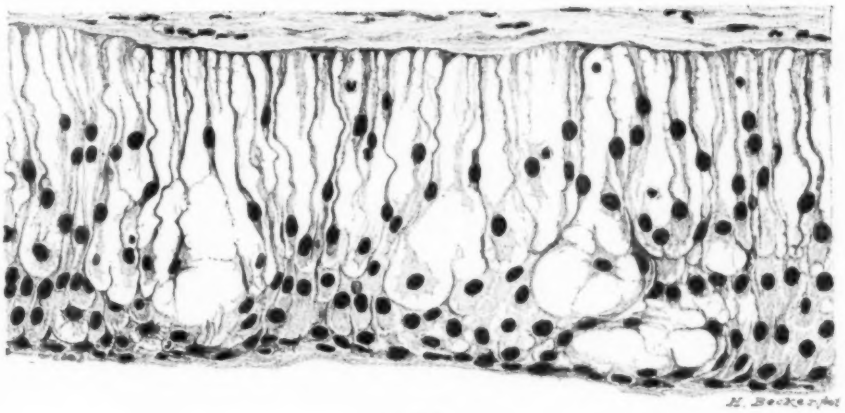

FIG. 2.

To face p. 292.

tion on its absorption leaves a cavity which may remain patent or be filled up by new tissue. Secondary degenerations are usually not pronounced. The symptoms are in general those of other spinal cord traumatisms, though usually less severe and less numerous; but the motor and sensory symptoms have distinguishing characters. The distribution of the motor symptoms depends upon the extent and situation of the clot. There may thus be spinal hemiplegia, or monoplegia, or (probably) brachial diplegia, or paralysis of the legs, or paralysis of both arms and legs. The paralysis at first, unless the lesion is very small, is flaccid in all its characters; later it assumes the central neurone type in the legs with places in the arms of peripheral neurone type. The sensory symptoms consist, in addition to pain in the neck, of a dissociated anæsthesia, that is, anæsthesia for temperature or for pain or for both, with perfect preservation of tactile sensibility. A case was reported in which this peculiar clinical condition was absolutely distinct, but in which, as shown by subsequent microscopical examination, the blood had exceeded to a certain extent the confines of the central gray matter of the cord. The sensory anomalies of primary focal hæmatomyelia from traumatism are usually transitory, unless the case is exceptionally severe. In reported cases the analgesia has disappeared before the thermoanæsthesia.

In the author's cases thermoanæsthesia was the only sensory anomaly present.

Diagnosis depends chiefly upon this dissociated anæsthesia; light is further thrown upon it by the transitory paralysis of most muscles and by the general rapid improvement of the patient.

The prognosis is better than for any other form of injury to the cervical region of the spinal cord. Several cases were cited from literature to show how rapid recovery may be. Two personally observed cases were also reported. In one, after complete paralysis of arms and legs, with loss of power of the sphincters, resulting from a diving accident, the patient could use his hands, and walk unassisted up four pairs of stairs, in less than two months; in the other, a man who, as the result of a fall of thirty feet, was completely paralyzed in the legs, with retention of urine, was able to go to work (night-watchman) in two months.

The treatment is the same as for other varieties of spinal cord injuries, except that any operative measures are strongly contraindicated.

Dr. PRESTON.—I have been very much interested in Dr. Bailey's clear presentation of this subject. It is an extremely suggestive paper. As he was reading the paper I could not help wishing I had had this particular knowledge many years ago. It has been my fortune or misfortune to see quite a large number of these cases of spinal injury, for the City Hospital is located in the centre of our city, and many cases of sudden injury are brought in there.

One of the most puzzling questions connected with these cases is that referring to the advisability of surgical interference. I have been always of the opinion that where we can be sure that there is direct injury to the column there should be prompt interference. I can recall now, however, a certain number of cases in which I advocated operation and where the after results proved that it would have been better not to have opened the column. Again I can recall cases that I am sure would have been benefited by an operation. We had no definite symptoms to decide the question as to whether there was simply this focal injury or whether we had an injury which involved the bones and portions of the spinal cord, particularly the white columns. The hopes that were raised a dozen years ago by surgical exploration of the brain have not been borne out. We have had to limit the sphere of surgical interference, but I think neurologists are now looking strongly to some sort of surgical interference in injuries of the spinal cord. I think, perhaps, there may be some slight predisposing cause here in Baltimore to hæmorrhagic myelitis. At any rate we see a large number of such cases. Dr. Osler has just whispered the suggestion that it is due to the smooth pavements of Baltimore.

We can now, after what Dr. Bailey has told us, differentiate clearly between cases of focal hæmatomyelia and cases in which the cord has been injured. The loss of pain and temperature sense and the preservation of tactile sensibility are two valuable points in the diagnosis. He has also given the neurologists help in enabling them to give a favorable prognosis in these cases, which is a boon to men practicing upon a class of cases where few die and none get well.

Dr. BARKER.—I am grateful to have had the opportunity of listening to a paper so rich in personally studied matter and first-hand experience.

The difference in the etiology of spinal hæmorrhages and of cerebral hæmorrhages is obvious from what Dr. Bailey has said. While nearly all spinal hæmorrhages are due to trauma, relatively few cerebral hæmorrhages are thus produced, the majority of the latter being dependent upon chronic arterial disease. A spinal hæmorrhage due to vascular disease is one of the rarest of pathological findings.

If I understood Dr. Bailey correctly he referred in one part of his paper to the possibility of occurrence of an anæsthetic area in which no painful sensations resulted on the application of heat, though pain could be elicited by ordinary methods of stimulation. I have been convinced myself in the study of sensations that "heat-pain" is due to the stimulation of pain nerves and not to the stimulation of "temperature nerves," *i. e.* the warm-points or cold points. In areas on the circumscribed area of elective sensory paralysis on my own left arm where pain sensations are the only ones which can be elicited by any method of stimulation, a test-tube heated above a certain temperature, after a certain latent period, will always cause pain not preceded or accompanied by any temperature sensation. The studies of von Frey demonstrate conclusively the existence of points in the skin which when stimulated give rise to painful sensations, but not to thermal or tactile sensations. In the case I have studied all the warm-points, cold-points and pressure- or tactile-points in certain areas are thrown out of function and the pain-points alone yield a response. Ice and heat applied to these areas cause painful sensations, but no feeling of cold or warmth. One interesting feature of the heat-pain and cold-pain as studied upon surfaces supplied only with

pain nerves is the latent period of the pain. When one carefully applies a piece of ice or a hot test-tube to such an area he has no sensation at all at first; only after the lapse of some seconds does any sensation result. There is first disagreeableness which soon goes over into distinct pain. Ordinarily when a hot test-tube is applied to normal skin the part is jerked away quickly. This is due to the fact that there is such violent stimulation of the heat-points that we are warned that if we do not remove the arm pain will result. We say that it hurts, but as a matter of fact we are not hurt but only warned that we shall feel pain unless the heat be removed. The same is the case in applying a piece of ice. If the ice remains in contact long enough we have "cold-pain," but the first effect on normal skin is a violent stimulation of the cold-points with a startling sensation of cold. I have wondered if heat-pain and cold-pain are ever really absent in areas where pain-sensations can be elicited by the application of ordinarily painful stimuli, such as pricking with a needle. I am of the opinion that the prolonged contact of ice or hot water would give rise always in such cases to the sensation of pain. May it not be that the existence of heat-pain and cold-pain is often overlooked in cases in which the cold-points and warm-points are thrown out of function. Many, of course, still hold that heat-pain and cold-pain are due to over stimulation of temperature nerves and not due to the stimulation of specific pain nerve, but this view is irreconcilable with our present physiological and pathological knowledge.

I would add a few words with reference to the relation of hæmatomyelia to syringomyelia and central glioma. Since the investigations of Minor, early in this decade, the attention of all neuro-pathologists has been directed towards this dissociation of sensation or elective sensory paralysis in cases of central hæmatomyelia. As Dr. Bailey has said there can be but little doubt in most cases with regard to differential diagnosis, for the symptoms follow so directly upon the trauma that one can scarcely make a mistake. The pathology of these cases, however, is somewhat more puzzling than their clinical history. A number of cases have been studied in which in addition to hæmorrhage, or the signs of old hæmorrhage, cavity formation with gliosis (or gliomatosis) in the periphery of the cavities has been observed. Some pathologists assert that after hæmatomyelia not only may partial obliteration of the hæmorrhagic cavities by glia tissue occur, but these cavities may become lined later by glia cells and thus give rise to syringomyelia or even be the starting point of a central gliomatosis. Minor goes so far as to suggest that such cavities secondary to hæmorrhage may possibly at once or later become connected with the canalis centralis, receive an ependymal lining from this and so give rise to the appearance of a malformation of the cord. One cannot help being somewhat skeptical with regard to such a point. It is certainly not to be forgotten that in so-called gliomata in which the main constituents are cells of the ependymal type multiple cavities are frequently found, and there seems to be a special tendency to hæmorrhage in such cases. In a case of this kind where such multiple cavities exist with surrounding gliosis or ependymal tumor formation a slight trauma might produce a hæmorrhage, and the symptoms would be those of hæmatomyelia. Clinically this might present the typical picture of primary hæmatomyelia, but pathologically it would have to be considered as hæmatomyelia secondary to the new growth.

I would also like to ask Dr. Bailey if he has, in his experience, met with any case of bilateral gummata giving rise to dissociation of sensation of the syringomyelic type.

Dr. BAILEY.—Replying to an inquiry from Dr. Osler I would say that I think undoubtedly many of the cases once called concussion of the spine were cases of intra spinal hæmorrhage.

In regard to Dr. Barker's inquiries I have never personally seen analgesia in these cases except for thermal stimuli, but I did not examine to see whether after a certain time of application of heat the patient complained of pain. We held the water on for a few seconds only.

As to the ependymal lining of the gliosis that occurs after cavity formation I have only had the opportunity of seeing one case in which I could trace the whole process. The man was an active man and healthy in every other way. In his case there was a large growth in the central part of the spinal cord, but it was in no way connected with the central canal. The central canal is the part of the gray matter that seems to escape most frequently in hæmatomyelia, and in the case to which I made reference this canal was normal and there were no ependymal cells lining the cavity.

As to bilateral gummata, I have no doubt they could give rise to dissociated anæsthesia as many other processes do, such as pachymeningitis.

In the cases I have examined the knee-jerk has been absent for two or three weeks, but entirely returned at the end of two months. As to the cause of the absence of knee-jerk I am sure I do not know.

Two Cases of Pylorectomy.—Dr. FINNEY.

The first case is that of a man about 50 years of age who presented himself at the Hospital on July 15, '98, complaining of distension of the stomach, daily vomiting, and constipation. His family history was negative. For about one year he had noticed a pain in the stomach, accompanied by a full feeling, and had lost weight, falling from 126 pounds to 95 pounds in the course of the year. He began to vomit after eating his meals, and has vomited twice daily about a quart, more or less, of light brown, sour material. He says that he has vomited material which he had eaten the day before, or even two days previously. The day before entering the hospital he vomited a little bright red blood.

On examination he appeared rather emaciated, had a temperature of 99.4°, pulse of 52, with a volume full and firm, pupils equal, skin moist and mucous membranes of good color. There was considerable arterio-sclerosis. His heart sounds were regular, and there was no murmur. His abdomen was soft and not distended. Waves of peristalsis were seen moving from left to right. To the right and just above the umbilicus a hard mass could be felt, about the size of one's thumb, which moved up and down with respiration. Examination of the contents of the stomach showed no free hydrochloric acid, and microscopically no tumor cells.

The diagnosis of carcinoma of the pylorus was made, and an

operation advised. He was operated upon July 20th. The stomach was irrigated daily, for a day or two beforehand, and rectal feeding only, for 24 hours previously. A small incision was made under cocaine anæsthesia, as I had promised him I would make an exploratory incision first, to find out what the trouble really was before giving him a general anæsthetic. Under cocaine then, I made an incision about 4 inches long in the median line, exposed the tumor so that I could see and feel distinctly its outlines, also an enlargement of some of the mesenteric glands, and thus confirmed our previous diagnosis. Ether was then administered and the operation proceeded with. The median incision was enlarged, and also a lateral one was made through the right rectus. We found a hard, scirrhous mass about the pylorus, which was a little larger than it had appeared through the abdominal wall. This was removed without any particular difficulty except that the duodenum was very adherent to the head of the pancreas, and we had some difficulty in arresting hæmorrhage after its separation. By dividing through the duodenum the growth was removed with a portion, perhaps one-third, of the stomach, which I have here. Several enlarged mesenteric glands were also removed. The stomach was sutured in the usual manner, grafting the duodenum into the stomach after partially closing the cut end. There was no difficulty in doing this. I used the mattress suture of Dr. Halsted, and closed the abdomen without drainage. He made an uninterrupted recovery.

The patient is present to-night, having kindly come from Pennsylvania to attend this meeting. He has gained 30 pounds in weight since July 15th. You may be interested in seeing the man and examining the condition of the wound at present (exhibiting the patient). You will see that the scar is very firm, and there is no weakening of the abdominal walls due to the section of the rectus.

CASE II. Case II is that of a man 56 years of age who came to the Hospital on October 12, '98, and was operated upon in the clinic. His family history is also negative. About 4 months ago pain began in the epigastric region, starting first in the left hypochondrium, beginning about one-half hour before meals, and relieved after eating. He never suffered with it directly after eating. It was not much worse when he came to the Hospital than at the time he first noticed it, and now it passed over the whole upper portion of the abdomen. There had been some nausea and vomiting, with rapidly increasing weakness for the past few months. He had lost in weight he thought about fifteen pounds. He looked as if he had lost more than that, as he was rather emaciated. Nothing was made out on physical examination except that in the abdomen to the right of the median line, in the upper umbilical region, there was a slight tumefaction. On turning to the right in the recumbent position this mass moved to the right about 1 cm., and when turning to the left it moved to the left 3 cm. Here is a drawing showing the location of the mass and the relative position before and after dilatation of the stomach.

Analysis of the stomach contents showed no free hydrochloric acid, and a faint trace of lactic acid. This case was also diagnosed as cancer of the stomach, probably of the pyloric end, and involving a portion of the stomach. He was operated upon October 21st under ether. Incision was made in the median line, the stomach was delivered and packed about with gauze. The adhesions were not so marked as in the other case, although the omentum bothered us considerably by being adherent below, and the larger portion of it had to be ligated and divided. Some glands felt to be enlarged, below the stomach in the omental fold, were removed, I think about four in all. There was no particular difficulty about the operation, the same procedure being employed here as in the other case, with this exception, in the second operation I removed much more of the stomach, taking out at least two-thirds, and sutured the duodenum to what was left of the stomach. The growth in this case extended much more along the lesser curvature of the stomach than along the greater, so that I took out an additional V-shaped piece here, and thus facilitated the subsequent suture very much. The procedure is an old one, having been suggested first by Billroth. After suturing the cut edges where the V-shaped piece had been removed, the opening in the stomach was found to match the lumen of the duodenum exactly, and I then had a simple circular suture of the intestine, and made use, in performing it, of the dilatable rubber bags of Dr. Halsted.

The first case made an uninterrupted recovery. He complained of nothing after the operation save hunger, and so bitterly did he complain of this that we gave him some milk thirty hours after the operation. The second was one of those unfortunate cases that happen now and then, in which the operation was a great success, but the patient died. The operation was very satisfactory, the enlarged glands we had felt were removed without difficulty, and, as it proved subsequently at autopsy, all the enlarged glands were removed. The case did well surgically, there were no symptoms of peritonitis and no pain, but he rapidly developed a typical pneumonia in the right lung, which extended to the left, and on the fifth day he died. The autopsy showed an extensive double lobar pneumonia.

Cover-slips from the abdomen were negative. There was not a single adhesion between the abdominal wound and the site of operation, and the peritoneal cavity was perfectly dry. It was unfortunate that this man should have developed a pneumonia, as apparently all the growth had been removed.

Dr. CUSHING.—One of the most striking features of Dr. Finney's report lies in the closure of the abdominal wound without drainage after a long operation necessarily associated with more or less soiling of the peritoneal cavity. Of course the peritoneum will take care of a certain number of micro-organisms provided no non-absorbable material such as a bit of necrotic tissue or fæcal matter is left behind. In these operations high up in the intestinal tract, however, another most important and encouraging factor must be taken into consideration, namely, the organisms or better, lack of organisms, which the peritoneum has to take care of. In Dr. Finney's first case unfortunately no cultures were taken from either duodenum or stomach. In the last case in which the healing was so perfect and clean, cultures taken from the duodenum at the time of operation remained sterile and cover-slip preparations were negative. It is astonishing to consider that the duode-

num should be free from micro-organisms especially in a case of this sort where there has existed a condition of chronic disease. My attention was first attracted to this subject a year ago after operating upon a case of perforating gunshot wound of the abdomen in which, though twenty-seven hours after the accident, but a slight degree of peritonitis was present. There were four perforations present in the upper part of the jejunum. On looking over the cases of gunshot wound with intestinal perforation which had previously been operated upon in the hospital, I found, strangely enough, that the only ones which had recovered were those of jejunal perforations. Since that time we have been observing very carefully indeed the bacteriology of all cases in which the upper part of the alimentary canal is opened on the operating table and have found the duodenum sterile on several occasions. This I think is an all-important prognostic feature of these cases, and I do not know that it has ever been emphasized before. In conjunction with Dr. Livingood I spent several weeks last spring upon some experimental work with animals which gave us very much the same results as we had observed clinically. It apparently is possible in some instances to render the greater part of the intestinal tract surgically clean before operation, that is, free from pathogenic micro-organisms. I hope soon to publish the results of our observations.

Dr. CONE.—As Dr. Flexner is not here to speak of the pathology of Dr. Finney's cases I might say a word. Most of us have been over the pathology of the last case. It showed only in a few areas the invasive character of the epithelium, but the glands were typically invaded with adeno-carcinoma. The gross appearance of the specimen from the second case was that of scirrhus carcinoma involving nearly the entire circumference of the stomach, showing no ulceration, but the mucosa had been worn off. Frozen sections showed masses of spindle cells and round cells which made us think of sarcoma although it is one of the rarest tumors of the stomach. There were tumors of very few epithelial cells in teased sections.

These tumors of the stomach may be classified as follows: medullary, scirrhus, colloid and diffuse carcinoma. The last case was most interesting because it shows how the stomach may be invaded by a growth that cannot be determined microscopically from an examination of the tumor itself, but one must go further and look at the glands which show typical adeno-carcinoma.

Dr. FINNEY.—I would like to say a word as to the anæsthetic used in these cases. In the last case the patient impressed us as being a poor subject for a long, depressing operation. The operation varies in length from one to three hours, depending upon the difficulties with which one meets, and the rapidity of the operator. A patient who is under an anæsthetic for two hours must of necessity be affected to some extent. It has been proven, first by Dr. Halsted in his breast operations for cancer, that hæmorrhage is the prime factor in shock in most cases. That rule holds good in most instances except in operations in the peritoneal cavity. In the latter instance the element of time certainly plays an important part, and so if we have a long, depressing operation upon a patient who has lost many pounds in weight, we have a patient already pulled down, and in a condition to stand very poorly any marked strain. The question of choosing an anæsthetic then becomes a very serious one. If one could do these operations satisfactorily under cocaine it would be a great gain, but when it comes to an operation of this sort where you have to handle the stomach so much, and do so much violence to the solar plexus, so to speak, you must use a general anæsthetic. I debated in my own mind the relative advantages and disadvantages of chloroform and ether, and decided in favor of the latter. I believe that the ether played a very important part in the production of this patient's pneumonia. We need a new anæsthetic for cases of this sort. Neither ether nor chloroform is an ideal anæthetic, particularly for cases of this kind.

The Non-Medical Treatment of Epilepsy.—Dr. HURD.

Within a few years past a new departure has been made in the treatment of epilepsy. The former treatment by medicine alone has been unsatisfactory, and remedy after remedy has been used and discarded. Surgical operations also have been performed, in some instances with good results, but in a great majority of instances with little benefit.

In epilepsy we do not deal with the epileptic paroxysm alone but with a complexus of symptoms, among which the epileptic convulsion may be regarded as the last of a series of morbid processes.

The majority of epileptics possess an extremely weak nervous system, perhaps inherited, and the individual patient is always unduly susceptible to disturbing influences. It has been known for a long time that the causes of epilepsy varied. In many instances epilepsy has been thought to be due wholly to disturbances of digestion, but it is now pretty evident that we have to deal with a more serious trouble. It is not primary digestion alone but often secondary digestion which is at fault. There is some defect in metabolism as a result of which the system becomes poisoned. The neurotic organization to which I have referred being unduly responsive to the action of this poison is overwhelmed by it and we have an epileptic paroxysm. It was formerly thought that if some remedy could be found to control the paroxysm, epilepsy was cured, but now we know that remedies which merely control the paroxysm do very little to cure the disease. It is like tying the hands of a maniac to cure his excitement. The general effect of the bromides and of similar remedies has not been to prevent the generation of the poison in the system, but merely to restrain its manifestation in an epileptic attack. Such restraint may be effective for a time, but finally the poison becomes so overwhelming that a paroxysm can no longer be restrained, and a furious convulsion follows which probably equals in force the sum of the minor paroxysms which had been prevented by the remedy. It has been found by experience that the condition of such a patient is worse than if he had more frequent but milder convulsions.

It has been found in institutions for the insane that the effect of large doses of bromide upon insane epileptics has been to deaden their sensibilities, to increase their growing dementia and to render them more furious and dangerous; and the

majority of physicians who have to deal with this class of patients long ago concluded that it was unwise to attempt to cure these patients by remedies which were given to check convulsive seizures.

Recent observations have indicated the character of the poisonous substances which enter the circulation and produce the epileptic seizure. They are probably leucomaines, but their exact relations to the disease have not been fully worked out and much remains to be done to determine the means of preventing the formation of these poisons in the system. There has however grown out of these investigations a system of providing for epileptics which promises much for the future. In this system it is not intended to substitute hygienic and moral influences for medical treatment or to decry medical treatment, but rather to relinquish the idea of depending upon drugs alone in the treatment of epilepsy.

Within the past few years provision has been made in many States for the care of epileptics in large colonies. The epileptic is not a pleasant member of the home circle whether he is sane or insane, and he seldom does well if treated at home in the family, being difficult to control and unable to co-operate in curative measures. In New York, Ohio and to some extent in other States institutions for their special treatment have been started. In the majority of instances this treatment consists in giving the epileptic the largest possible amount of open-air life and in controlling his diet so that the amount of nitrogenous food may be carefully regulated. It is equally essential that the growing epileptic shall have something to do. It has been found that patients fed upon drugs with nothing to do have frequent epileptic seizures, while, if kept employed in the open air the seizures are less frequent. An attempt is now made to give them useful labor every day under medical control with the theory that a physician should in every case prescribe the kind and amount of labor and the time of day it should be performed. Many epileptic patients are prone to seizures immediately after meals, especially if allowed to fall asleep. It is necessary therefore in all matters which relate to the labor of the patient that the medical man shall say when and how the patient shall exercise.

As the result of such treatment patients who have been subject to daily or weekly seizures often without any medicine, go a month, sometimes a year, or longer without a convulsion.

From our present knowledge the best treatment for an epileptic is an open-air life, carefully selected food and a judicious amount of labor.

NOTES ON NEW BOOKS.

Atlas of Legal Medicine. By Dr. E. von HOFMANN. Translated by FREDERICK PETERSON, M. D., and ALOYSIUS O. J. KELLY, M. D. 56 plates in colors and 193 illustrations in black. (*W. B. Saunders, Philadelphia*, 1898.)

The previous volumes of the present series of Atlases have been reviewed in these pages as they have appeared. The series is a very valuable one, and well illustrates the importance of colored drawings in representing natural objects in the domain of medicine. To pathologists, and especially to coroners' physicians, the present volume will be found of service. It is manifestly quite impossible to do more than draw attention to the salient features of the work, for to do it justice in a review a record of the various medico-legal conditions described would be necessary. The object of the Atlas is to show the appearances met with in organs and the body in general in case of death from violence or unexplained causes, which come under the jurisdiction of coroners or their physicians. As in this country we do not have a specially trained set of legal physicians, the opportunity to become familiar with many of the objects treated of in the volume is open to few; and therefore as a work of reference in doubtful instances, or as affording an opportunity to study the effects of poisons, etc., upon the organs, the Atlas will fulfil a useful purpose.

Annual and Analytical Cyclopædia of Practical Medicine. By CHARLES E. DE M. SAJOUS, M. D., and one hundred Associate Editors. Volume I. (*The F. A. Davis Co., Publishers, Philadelphia*, 1898.)

The Annual of the Universal Medical Sciences comes to us now in a new form, that of an Analytical Cyclopædia of Medicine. The change is explained by the editor, and would seem to better fit it for the use of the practitioner of medicine to whom the original "Annual" often failed to give the desired information. The general appearance of the pages is somewhat novel, as the newer literature upon etiology, treatment, etc., is interpolated at irregular intervals in the general text, occupying a smaller sized type. Thus each subject is treated in a complete fashion as in any modern textbook, and may be read as such by confining the attention to the large type only, while the recent additions to the subject may be obtained in the course of this reading, or separately by consulting the matter in small type. It is expected that the entire domain of medical subjects will be embraced in six volumes. The present volume covers the subjects from "Abdominal Injuries to Bright's Disease." The list of associate editors embraces some of the best known names in this land and foreign countries.

The Methodist Episcopal Hospital Reports, Vol. I, 1887–1897. Edited by LEWIS STEPHEN PILCHER, M. D., and GLENTWORTH REEVE BUTLER, M. D., (*New York: Published by the Hospital*, 1898.)

This handsome volume contains a history of the Hospital from its beginning, together with the usual scientific medical reports from the officers of its medical staff. The longest of these contributions are those on the several diseases of the female genital organs and on operative methods, by Dr. L. S. Pilcher, on the injuries of the cranium and spine and on appendicitis, by Dr. George R. Fowler, on fracture by Dr. J. P. Mathews; and there are besides a number of minor reports, all of interest and value. It appears that from the first the surgical side of the Hospital has received the largest patronage—over two-thirds of the total number of patients suffering from diseases requiring surgical relief; hence the predominance of surgical papers in this volume. The medical side is, however, also well represented by valuable reports by Drs. Butler, Mathews, Shaw and others.

The volume is beautifully printed, and the illustrations are especially good, and even the half-tones are intelligible and useful, which is not always the case in works of this kind. In these as well as in other respects the authorities of the Methodist Episcopal Hospital have set a high standard for their future reports.

The Anatomy and Functions of the Muscles of the Hand and of the Extensor Tendons of the Thumb. By J. FRANCIS WALSH, M. D. Essay awarded the Boylston Prize for 1897, Department of Anatomy and Physiology, by the Boylston Medical Committee, Boston, Mass. (*Philadelphia: Charles H. Welch*, 1897.)

The merits of this careful and thorough study of the anatomy of the human hand are directly evidenced by the fact that it is the

Boylston Prize Essay of last year. It is a thorough critical study of the gross anatomy of a very important region which can hardly fail to have some practical bearing on some of the surgical questions that may from time to time arise on the musculature of the hand. The theoretical value of such studies is of course beyond question.

Medical and Surgical Reports of the Boston City Hospital. Ninth Series. Edited by CHARLES F. FOLSOM, M. D., W. T. COUNCILMAN, M. D, and HERBERT L. BURRELL, M. D. (*Boston: Published by the Trustees*, 1898.)

About half this volume is taken up with the discussion of diphtheria in some of its aspects, and the papers are of decided value and interest. In Dr. Jenks' study of the nervous system in this disease, the microscopic examinations were largely confined to the pneumogastric nerve, though the spinal cord was also examined in some cases and the brain in one or two. It is to be desired that a more thorough investigation of the higher nerve centres should be made in this disease than seems to have been done so far.

The other papers in this volume, are all apparently meritorious, as might be assumed from the names of the editors. Those on formaldehyde as a disinfectant, and on the anæsthetics used in the eye, are among the longest and are of considerable practical interest.

In the surgical abstract accounts are given of several cases of foreign bodies in the digestive tract, that are of interest in connection with some occasional hospital experiences, and as showing how such bodies are liable to behave under certain conditions. In one case a plate with three false teeth was passed safely in the natural way; in another a similar plate and teeth lodged in an enlargement of the œsophagus, and was only detected there by the dangerous hemorrage it produced. In still another case a fish bone ulcerated through the peritoneum, causing an extensive abscess between it and the abdominal wall.

The volume is a worthy addition to a valuable series.

Epidemic Cerebro-Spinal Meningitis and its Relations to Other Forms of Meningitis. A Report of the State Board of Health of Massachusetts. (*Boston: Wright & Potter Printing Co., State Printers*, 1898.)

This report, by Professor Councilman and Doctors Mallory and Wright, will take rank with the best scientific literature and become an authority upon this disease. It gives a historical sketch of the disorder, and full reports of over one hundred cases; its bacteriology, symptoms and complications; its diagnosis and relations to other forms of meningeal affections. Altogether, the report is one of the best monographs of its kind and compass on a single disease.

The relations of cerebro-spinal meningitis to mental disorders are only very briefly touched upon. Considering the fact that meningitis figures amongst the alleged causes of insanity so frequently, this is a little noteworthy here; the more so since the authors elsewhere express the opinion that "all infections of the meninges other than by the diplococcus intracellularis are fatal." There are many who will hardly accept this conclusion, but those who do can not avoid admitting that cerebro-spinal meningitis, due to the infection of the diplococcus intracellularis, is one of the more potent and frequent causes of insanity.

The report has a lengthy bibliography attached, but it "contains some omissions," to use a Hibernicism, some of which, it would appear, might have been included, the references certainly being noteworthy enough to have been included in the literature. As, however, the list given only contains those works and articles mentioned in the text, and is not represented to be a complete bibliography of the more important memoirs on the subject, this hardly calls for criticism. The report itself will most certainly be often quoted in the future and take a most honorable position in the literature of its special theme.

Doctor and Patient: Hints to Both. By Dr. ROBERT GARSUNG, Vienna. Translated, with the permission of the author, by A. S. LEVETUS, with a preface by D. J. LEECH, M. D., F. R C. P., etc. (*Bristol: J. Wright & Co.*, 1898.)

This is a work of a class that has had several representatives in this country, but it has a special value as showing how nearly alike the professional conditions are in all countries. The Vienna professor might have written his book for an English-speaking public in the first place, and hit nowhere amiss. The fact is, the doctor and patient stand in the same relations to each other over the whole civilized world, and the same ethical questions, troubles and trials exist in one place as well as in another. Here we have in our cities the dispensary evil, and in our country generally too large a freedom of medical education and practice, which are only partly peculiar to us; in the older countries also we hear of the overcrowding of the profession, and the medical proletariat spoken of by Dr. v. Ziemssen in a recent address is an evil in Germany as well as here. There they have, moreover, the socialistic unions, cheapening medical practice, as in England. The "Battle of the Clubs" is an apparently perennial question for discussion in the medical journals. Another custom of medical practice which is generally reckoned with us as hardly commendable or profitable to the physician appears, judging from this little work, to be common enough in Austria as to be accepted as perfectly normal, viz. the regular season contract with patients and their families. If this is the usual or even common practice it is rather to our European confrères' disadvantage.

The ethical tone of the work is, as might be expected, the very best, and it is one that will be profitable for occasional reference by the old practitioner as well as valuable to the beginner in the medical profession.

A Text-book upon the Pathogenic Bacteria for Students of Medicine and Physicians. By JOSEPH MCFARLAND, M. D. Second Edition. 1898. 497 pages. 8vo. (*W. A. Saunders, Philadelphia.*)

We had occasion to review the first edition of this work in August, 1896. In this edition parts have been rewritten and new chapters have been added, which have much enhanced the value of the work. In the light of our present knowledge the omission of cerebro-spinal meningitis under the section on acute inflammatory processes is much to be regretted. In the chapters dealing with general technique, the author at times recommends measures which are now somewhat obsolete, and some procedures are faultily described. We do not think that the majority of bacteriologists would coincide in Dr. McFarland's remarks concerning the action of light upon bacterial growth, and to many they would seem quite erroneous upon the whole. Contrary to the statement in the book we have invariably found the house-mouse highly susceptible to anthrax; also the growth of staphylococcus pyogenes aureus is by no means most typical upon nutrient agar-agar, but upon potato, when grown at room temperature. The statement regarding the streptococcus pyogenes and the dipiococcus pneumoniæ having *no* growth upon potato, we believe to be exceptionally the case and not the rule. The author's view that the pseudo-diphtheria bacillus is but an attenuated variety of the true bacillus diphtheriæ is now considered untenable. Several of these errors were pointed out in a review of the first edition. Until they are corrected the book cannot be entitled to the praise it otherwise might readily command. The arrangement of the book as a whole is good, and the matter of its various subjects is commendably planned and dealt with, while its photographic reproductions and general make-up are of a high order of excellence. N. MACL. H.

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Men and women are admitted upon the same terms.

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